

DOCUMENT RESUME

ED 438 686

EC 307 709

AUTHOR Victor, Shelley J., Ed.; Lundy, Donna S., Ed.
TITLE Florida Journal of Communication Disorders, 1998.
INSTITUTION Florida Association of Speech-Language Pathologists and Audiologists, Tallahassee.
PUB DATE 1998-00-00
NOTE 60p.
AVAILABLE FROM FLASHA State Office, 335 Beard St., Tallahassee, FL 32303. Tel: 305-243-5290; Fax: 305-243-5291; e-mail: dlundy@mednet.miami.edu.
PUB TYPE Collected Works - Serials (022)
JOURNAL CIT Florida Journal of Communication Disorders; v18 1998
EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Adults; *Audiology; Children; Cultural Differences; Elementary Education; Evaluation Methods; *Hearing Impairments; Infants; Kindergarten Children; *Language Impairments; Lipreading; Phonetics; Preschool Education; Reading Difficulties; Screening Tests; *Speech Impairments; *Speech Language Pathology; Speech Therapy; Stuttering; Test Norms; Toddlers; World Wide Web; Young Children
IDENTIFIERS Florida

ABSTRACT

This annual volume is a compilation of research, clinical, and professional articles addressing innovative technology, new diagnostic tests, physiological basis for treatment, and therapeutic ideas in the fields of speech-language pathology and audiology. Featured articles include: (1) "Development of Local Child Norms for the Dichotic Digits Test" (Gail Gegg Rosenberg); (2) "Screening Kindergarten Children To Assess Risk for Reading Difficulties" (Laurie M. Gauger and others); (3) "Infant-Toddler Communication Inventory," which discusses a screening tool used to identify young children at risk for developmental disorders (Linda J. Lombardino and Kelli Murphy Vaudreuil); (4) "Understanding Exercise: A Tutorial," which presents a tutorial for understanding the basic physiology of exercise as it relates to common therapy practices (Edie R. Hapner); (5) "Different Phonetics for Different Folks: Studies of Speaker Differences at UCF," which presents research on differential voice onset times in different ethnic groups (Jack Ryalls and others); (6) "The World Wide Web as a Source of Therapy Ideas: 20 Practical and Applied Sites for Use with Culturally and Linguistically Diverse Students" (Alejandro Brice and Cleste Roseberry-McKibbin); (7) "The Impact of Identifying Preferred Treatment Outcomes on Conceptualizing, Assessing, and Treating Chronic Stuttering" (Eugene B. Cooper and Crystal S. Cooper); and (8) "The Falconer 'Lipreading' Test for Nonorganic Hearing Loss" (Teri A. Hamill and others). (Articles contain references.) (CR)



The Florida Journal of Communication Disorders

VOLUME 18, 1998

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to
improve reproduction quality.

• Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL IN MICROFICHE,
AND IN ELECTRONIC MEDIA FOR ERIC
COLLECTION SUBSCRIBERS ONLY,
HAS BEEN GRANTED BY

Lundy

2A TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

Contents

Florida Association of Speech-Language Pathologists and Audiologists
VOLUME 18 Florida Journal of Communication Disorders 1998

Florida Association of Speech-Language Pathologists and Audiologists
Florida Journal of Communication Disorders - Volume 18

Contents

Development of Local Child Norms for the Dichotic Digits Test	4
<i>Gail Gegg Rosenberg</i>	
Screening Kindergarten Children to Assess Risk for Reading Difficulties	11
<i>Laurie M. Gauger</i>	
<i>Linda J. Lombardino</i>	
<i>Shireen Pinheiro</i>	
Infant-Toddler Communication Inventory	20
<i>Linda J. Lombardino</i>	
<i>Kelli Murphy Vaudreuil</i>	
Understanding Exercise: A Tutorial	39
<i>Edie R. Hapner</i>	
Different Phonetics for Different Folks: Studies of Speaker Differences at UCF	43
<i>Jack Ryalls</i>	
<i>Penelope Baldauff</i>	
<i>Julius Fridriksson</i>	
<i>Dianne Thornburgh</i>	
<i>Allison Zipprer</i>	
The World Wide Web as a Source of Therapy Ideas: 20 Practical and Applied Sites for Use with Culturally and Linguistically Diverse Students	45
<i>Alejandro Brice</i>	
<i>Celeste Roseberry-McKibbin</i>	
The Impact of Identifying Preferred Treatment Outcomes on Conceptualizing, Assessing and Treating Chronic Stuttering	47
<i>Eugene B. Cooper</i>	
<i>Crystal S. Cooper</i>	
The Falconer "Lipreading" Test for Nonorganic Hearing Loss	52
<i>Teri A. Hamill</i>	
<i>Susan Karasik-Rush</i>	
<i>Mark N. Segal</i>	

1998 EDITORIAL COMMITTEE

Editors

Shelley J. Victor
Donna S. Lundy

Editorial Review Committee

Joseph Gonzalez
Teri Hamill
Barbara Packer
Elizabeth Roberts
Elizabeth Sperry
Carole Zangari

This is an official annual publication of the Florida Association of Speech-Language Pathologists & Audiologists. All editorial or advertising correspondence should be addressed below. The editor assumes no responsibility for the accuracy of bibliographical notations.

General Editorial Policy All articles submitted for consideration in the Journal undergo peer review.

Manuscripts for the 1999 volume of the Journal may be submitted to:

Donna S. Lundy, M.A., Editor

Florida Journal of Communication Disorders
P. O. Box 016960 (D-48)
Miami, FL 33101-6960

1998-1999 FLASHA EXECUTIVE BOARD

President

Joseph J. Langhans

President-Elect

Shelley J. Victor

Immediate Past President

Alina de la Paz

Vice President for Convention

Stacie Rubin Smith

Vice President for Continuing Education

Mark J. Witkind

Vice President for Professional Practices in Audiology

Gregory J. Spirakis

Vice President for Professional Practices in Speech-Language Pathology

Susan R. Snover

Vice President for Educational Services

Bonnie J. Boger

Vice President for Governmental Education

Robert C. Fifer

Vice President for Public Relations/Resource Development

Cheryl Paul

Vice President for Publications

Donna S. Lundy

Treasurer

Jane B. Busbee

FOREWARD

Welcome to Volume 18 of the *Florida Journal of Communication Disorders* (FJCD). This edition represents a compilation of research, clinical and professional articles addressing topics in the fields of speech-language pathology and audiology. All articles have been peer-reviewed and thus are felt to well represent important ideas in the area of communications. As in the past, article submissions have come from around the state. We hope you will take the opportunity to read the innovative work of our fellow colleagues.

This edition of the *FJCD* features articles on innovative technology, new diagnostic tests, physiologic basis for treatment and therapeutic ideas. Dr. Teri Hamill, Ms. Susan Karasik-Rush and Dr. Mark Segal detail the specific applications of the Falconer Lipreading Test for Nonorganic Hearing Loss through case study design. Ms. Gail Gegg Rosenberg describes the importance of developing local pediatric norms for the Dichotic Digits Test. Ms. Edie Hapner presents a tutorial for understanding the basic physiology of exercise as it relates to common therapy practices. Dr. Linda Lombardino discusses the Infant Toddler Communication Inventory which is a screening tool to identify young children at risk for developmental disorders. Dr. Laura Gauger, Dr. Linda Lombardino and Dr. Shireen Pinheiro describe their work in identifying children at-risk for reading difficulties through longitudinal study. Dr. Jack Ryalls presents his research on differential voice onset times in different ethnic groups. Dr. Alejandro Brice shows an innovative way of using the internet as a source for therapy materials for multicultural interests. In addition, Dr. Eugene Cooper and Ms. Crystal Cooper discuss their interpretation of stuttering outcome data to delineate affective, behavioral and cognitive components of this disorder.

The opportunity to earn continuing education units (CEUs) by reading the *FJCD* was initiated last year and proved successful. Thus, we are including that option again. We understand that times are changing and the feasibility of attending conferences is limited. Everyone is looking for alternative methods to gain new information. We hope that you will find reading the *Journal* and answering questions a practical means of earning continuing education. CEUs are earned by those individuals that successfully answer the questions provided for each article. This may require reading about topics in areas other than your own particular specialty. As the field of communications is a broad one encompassing many specialized areas within audiology and speech-language pathology, we hope you will see this as a chance to learn more about our related fields.

Finally, the editorship of this *Journal* was a shared responsibility by the previous and current Vice Presidents for Publications. We would like to thank the many individuals who served on the Editorial Review Committee for their time, energy and expertise in reviewing the submitted articles and contributing to the peer review process. In addition, we would like to sincerely thank and congratulate all of the authors who have generously submitted their work to the *FJCD*. The journalistic process is a scholastic activity involving great amounts of time which we all know is a scarcity in this day and age. We truly appreciate the efforts of our colleagues around the state for their academic excellence.

Happy reading!

Shelley J. Victor
1997-1999 Vice President
for Publications

Donna S. Lundy
1998-1999 Vice President
for Publications

Development of Local Child Norms for the Dichotic Digits Test

Gail Gegg Rosenberg
School Board of
Sarasota County, Florida

The Dichotic Digits Test (DDT) (Musiek, 1983a) has been shown to be useful as an audiological screening procedure for detecting central auditory processing (CAP) disorders in children or as a component of the CAP battery. Published child norms for the DDT in mean (M) percent correct are not accompanied by standard deviations (SD) or other commonly used statistical information essential to determining the extent to which a child's performance may be different from that of age-alike peers. The purpose of this study was to obtain norms on the DDT at 12-month intervals for a pediatric population (N = 200) ranging in age from 5.0 to 12.11 years of age.

Over a 16-month period, 200 students referred for routine audiological evaluation were administered the DDT as part of the audiological test battery. Subjects exhibited normal peripheral hearing sensitivity and did not participate in any special services programs in the Sarasota County Florida School District. Data were analyzed to provide mean scores, standard deviations, and other statistical data. These norms allow audiologists evaluating young children to describe results consistent with current reporting procedures for the interdisciplinary evaluation of CAP disorders in children.

INTRODUCTION AND PURPOSE

A model explaining how the central auditory nervous system (CANS) manages dichotically presented stimuli was developed by Kimura (1961). Dichotic listening refers to the presentation of different auditory stimuli to both ears simultaneously. Broadbent (1954) is reputed to be the first to have utilized a dichotic digits paradigm to test both ears simultaneously. Kimura (1961) is credited with formally introducing dichotic speech tests into the arena of central auditory processing evaluation. This was accomplished by her adaptation of Broadbent's method for assessing hemispheric asymmetry and unilateral lesion effects. Kimura's method employed a triad of digits presented dichotically to evaluate central auditory functional processing ability (Bellis, 1996). The use of digits as stimuli continues to be a favored dichotic testing paradigm in the 1990s. Musiek (1983a) is noted for authoring the revision of Kimura's protocol, the Dichotic Digits Test, in which two digits are presented to each ear simultaneously. The Task Force on Central Auditory Processing Consensus Development acknowledged competing dichotic digits as one of the dichotic stimuli that can be used effectively to measure central auditory processing disorders (ASHA, 1996).

The Dichotic Digits Test (DDT) (Musiek, 1983) has been acclaimed as a

highly sensitive instrument that may be used as a screening tool for central auditory processing (CAP) disorders or a component of the CAP test battery (Bellis, 1996; Mueller & Bright, 1994; Musiek, 1983a; Musiek, Gollegly, Kibbe & Verkest-Lenz, 1991; Musiek, Gollegly, Lamb & Lamb, 1990; Stecker, 1992). Table 1 summarizes the features of the Dichotic Digits Test that render it an appealing dichotic test to be used in the audiological assessment of central auditory processing abilities in children.

Use of dichotic digits in the evaluation of central auditory processing abilities in children is recognized as a preferred practice with regard to maturational effects. Research has shown that the greater the linguistic load of the auditory stimuli, the more prominent the maturational effects are likely to be (Bellis, 1996). Maturation effects are noted on most tests of auditory perception, but perhaps more so on dichotic tests (Musiek, Gollegly, Lamb & Lamb, 1990). Very simply, the use of digits in a dichotic testing paradigm in the evaluation of children will very often show a different profile than that obtained for dichotic sentences. This occurs because the sentence stimuli are more linguistically loaded and place greater stress on the young child's ability to transfer information interhemispherically. Bellis (1996) rates the DDT as being somewhat near the middle of the continuum of least-to-most-difficult dichotic tests because the digit stimuli are very closely aligned and only lightly linguistically loaded.

Table 1. Summary of features of the Dichotic Digits Test (DDT) that render it appealing as a dichotic listening test to be used in the audiological assessment of central auditory processing (CAP) abilities in children.

The Dichotic Digits Test (DDT) is:

- highly sensitive as a screening test for central auditory processing (CAP) disorders
- easily administered in under five minutes
- able to be quickly scored
- a lightly linguistically loaded, closed-response set (digits 1-10, except 7)
- comprised of digits, which for some persons are easier to respond to than open-set word stimuli
- easily understood by children with directions that rarely need to be repeated
- relatively resistant to at least mild conductive or sensorineural hearing loss
- not rigidly controlled with regard to the subject's response time
- adaptable to other response modes such as pointing or writing

Published norms for children for the DDT are available only in mean percent correct scores. There are no accompanying standard deviations (SD) or other normative data. In the test's instruction guide, the author strongly recommends establishing local norms. There is a diagnostic and educational need to have available sufficient normative data for children that may be used to describe the degree of deviation from the norm. Test norms should be reported in terms that match the local regulations and current practices (Hutchison, 1996).

Thus, there are three very important reasons for establishing local normative data for the DDT so that results may be reported in a manner consistent with other individual assessment instruments used with children. First, when the DDT is used as part of a battery, it is difficult to describe an individual's performance with respect to findings of other audiological CAP tests. For example, it would allow a child's performance on the DDT to be compared with mean scores (and deviations from the mean) on tests such as the Screening Test for Auditory Processing Disorders (SCAN) (Keith, 1986) and the Staggered Spondaic Word Test (SSW) (Katz, 1986). Secondly, it becomes problematic when audiological CAP results are considered in comparison with psycho-educational and psycho-linguistic test results in the interdisciplinary assessment of students. Evaluation instruments in these domains typically provide statistical information such as SDs. Finally, establishment of local norms is strongly recommended by the test's author. The purpose of this study was to develop local norms for children ages 5.0 to 12.11 for the Dichotic Digits Test to increase the flexibility of this test with respect to current practices in reporting test performance.

MATERIALS AND METHODS

Subjects

Subjects were 200 participants whose ages ranged from 5.0 to 12.11 years. Age and maturation have been shown to influence CAP test results. Previous investigators have suggested obtaining normative data with children at each year under approximately 12 to 14 years of age (Musiek, 1990; Musiek & Lamb, 1994). The DDT's author currently provides only mean percent scores for the 7.0-11.11 age range. This study included younger students (5.0-6.11) as well as those in the 12.0-12.11 age range

due to the maturational concern and because many children below the age of seven years are referred for an audiological CAP evaluation.

Mean ages for the cohort of 25 students in each 12-month interval are shown in Table 2. The subject group included 96 males (48%) and 104 females (56%). Racial background of the students was: 149 Caucasian (74.5%), 39 African-American (19.5%), 7 Hispanic (3.5%), and 5 Asian (2.5%). Subjects in this study resided in a middle-sized Florida school district that has many resources available to its students both within the schools and the community. In addition, the school district's rate of free and reduced lunch is below the average for the State of Florida. The geographic area is primarily urban and suburban in composition.

Subjects were students referred for routine audiological evaluation. None of the students participated in any special services programs in the Sarasota County Florida School District at the time of evaluation. All students had normal peripheral hearing with pure tone thresholds at 15 dB HL or better for octave frequencies 250-8000 Hz. Speech recognition scores were 92 percent or better for each ear using age appropriate open-set recorded word discrimination lists (e.g., PBKs, CID W-22s, NU-6) presented at a 30 dB sensation level (SL) (re: spondee threshold). Immittance audiometry results were within normal limits for all subjects.

Dichotic Digits Test Procedure

The Dichotic Digits Test (Musiek, 1983a, 1983b) is composed of naturally spoken digits from one to 10 exclusive of the number seven. (However, the number seven

is included in the single digit subtest.) The DDT test is composed of 20 digit pairs for a total of 40 test items per ear. The two-digit stimuli on one channel of the tape have been aligned with the two digits on the other channel to produce a dichotic listening task.

Example: Left Ear 5, 4
Right Ear 2, 1

The cassette tape was played on an Optimus dual-channel tape player with channel one directed to the left ear and channel two to the right ear as per test protocol. The signal was fed through the speech circuitry of the Grason Stadler (GSI 10) two-channel clinical audiometer and passed on to TDH-39 earphones at 50 dB SL (re: spondee threshold). Testing was conducted in a double-walled I.A.C. sound treated room.

Each participant was given identical instructions adapted from those offered by Musiek (1983b). Adaptations were made in the narrative to accommodate the language level of the youngest participants. Following are the test instructions.

You will hear two numbers in each of your ears. Listen carefully in both ears and repeat all of the numbers you hear. Do not worry about repeating the numbers in any special order. If you are not sure about the numbers you heard, please guess. Now, let's practice.

Oral practice was provided prior to beginning presentation of the three tape recorded practice items. Participants were provided ample time to respond, and in some

Table 2. Age in years and gender of subjects (N = 200).

Age Range	Mean Age	Males	Females
5.0-5.11	5.5	12	13
6.0-6.11	6.5	12	13
7.0-7.11	7.4	12	13
8.0-8.11	8.4	14	11
9.0-9.11	9.5	11	14
10.0-10.11	10.5	14	11
11.0-11.11	11.4	11	14
12.0-12.11	12.4	10	15
Total Group	8.9	96	104

Table 3. Mean scores, standard deviations (SD), range of scores, and standard error of measurement (SEM) for subjects (CA: 5.0-12.11 years) for left and right ears on the Dichotic Digits Test.

Age	Left Ear				Right Ear			
	Mean	SD	Range	SEM	Mean	SD	Range	SEM
5.0-5.11	52.5%	7.1	42.0-62.0	1.4	69.9%	9.8	55.0-90.0	2.0
6.0-6.11	58.7%	9.9	48.0-75.0	2.0	71.5%	9.9	58.0-90.0	2.0
7.0-7.11	61.3%	8.3	50.0-80.0	1.7	73.9%	8.5	62.0-95.0	1.7
8.0-8.11	70.6%	8.2	60.0-88.0	1.6	79.9%	8.2	70.0-95.0	1.6
9.0-9.11	75.0%	7.0	62.0-90.0	1.4	81.7%	8.0	70.0-98.0	1.6
10.0-10.11	78.4%	6.8	68.0-92.0	1.4	86.3%	6.8	75.0-98.0	1.4
11.0-11.11	88.1%	7.1	75.0-98.0	1.4	92.6%	4.3	80.0-100.0	0.9
12.0-12.11	90.7%	5.7	75.0-98.0	1.1	96.2%	4.1	82.0-100.0	0.8

cases this did require a pause, which is allowable according to published test protocol. There is no required inter-stimulus interval and Musiek (1983a) indicates that the original norms were established with the subjects being given as much time as they wished prior to responding. Subjects' responses were recorded on a DDT worksheet routinely used in this clinical setting when administering this specific dichotic test. (See Appendix.) Subject responses were scored according to protocol provided by the test author, with the total number of correct responses being multiplied by 2.5 to

derive a percentage score rounded to the nearest digit.

RESULTS AND DISCUSSION

For the purpose of this study, statistics were applied to only the two-digit subtest of the DDT. Table 3 portrays a summary of local norms computed for the left and right ears that include mean scores in percent, standard deviation (SD), range of scores, and the standard error of measurement (SEM) for the eight age range groups. As is typical for this test and some other dichotic

tests, the left ear scores are lower than scores for the right ear for each age group. There was less variability in the 12.0-12.11 year old group as is shown by the lowest SDs. For both ears, with the exception of three instances, the SDs declined with an increase in age and this characteristic would appear to be characteristic of the maturation of the central auditory nervous system (CANS).

In Table 4, differences between Musiek's norms and normative data derived from the current Sarasota study are shown. In all instances, the current study shows higher mean scores. The larger differences

Table 4. Difference between published norms (mean percent) for the Dichotic Digits Test (Musiek, 1983a) and the current study.

Age Range	Left Ear			Right Ear		
	Musiek Norms	Sarasota Norms	Difference	Musiek Norms	Sarasota Norms	Difference
5.0-5.11		52.5%			69.9%	
6.0-6.11		58.7%			71.5%	
7.0-7.11	55.0%	61.3%	6.3	70.0%	73.9%	3.9
8.0-8.11	65.0%	70.6%	5.6	75.0%	79.9%	4.9
9.0-9.11	75.0%	75.0%	0.1	80.0%	81.7%	1.7
10.0-10.11	78.0%	78.4%	0.4	85.0%	86.3%	1.3
11.0-11.11	88.0%	88.1%	0.1	90.0%	92.6%	2.6
12.0-12.11		90.7%			96.2%	

Table 5. Summary of deviation from the mean for children (CA: 5.0-12.11 years) for left and right ears on the Dichotic Digits Test.

Age	Left Ear				Right Ear			
	Mean	SD	-1 SD	-2 SD	Mean	SD	-1 SD	-2 SD
5.0-5.11	52.5%	7.1	45.4%	38.3%	69.9%	9.8	60.1%	50.3%
6.0-6.11	58.7%	9.9	48.8%	38.9%	71.5%	9.9	61.6%	51.7%
7.0-7.11	61.3%	8.3	53.0%	44.7%	73.9%	8.5	65.4%	56.9%
8.0-8.11	70.6%	8.2	62.4%	54.2%	79.9%	8.2	71.7%	63.5%
9.0-9.11	75.0%	7.0	68.0%	61.0%	81.7%	8.0	73.7%	65.7%
10.0-10.11	78.4%	6.8	71.6%	64.8%	86.3%	6.8	79.5%	72.7%
11.0-11.11	88.1%	7.1	81.0%	73.9%	92.6%	4.3	88.3%	84.0%
12.0-12.11	90.7%	5.7	85.0%	79.3%	96.2%	4.1	92.1%	88.0%

at the 7.0-8.11 age levels may suggest a different maturational rate than that which characterized the subjects in the original normative study. For the left ear, differences between the two sets of norms are less than .50 for the 9.0-11.11 age level.

A summary of deviation from the mean is provided in Table 5. This information is also included on the DDT Worksheet used in this study. Because deviation from the mean is an important element in the interpretation of frequently used psycho-educational and psycho-linguistic tests, this information should be useful to audiologists in quickly determining a child's performance in several arenas. It will allow the audiologist to compare results on the DDT with other tests in the audiological CAP battery as well as the child's performance on psycho-educational and psycho-linguistic tests which may be considered in determining the child's eligibility for special education services.

An additional analysis of data that may be of interest is the summary of mean ear difference scores for each of the eight age groups. (See Table 6.) These data allow the audiologist to determine if the ear difference is normal or abnormal. For instance, if the right ear score is very strong and the left ear score is weak, but within the normal range, the ear difference may actually exceed the mean. In such cases, this finding could provide important information to support or refute an ear difference identified on another test in the CAP battery.

The normative data obtained in this

study will facilitate greater confidence in reporting audiological CAP results to parents and other professionals. It will now be possible to compare a student's performance on the DDT with his/her results on other CAP tests that provide SDs (e.g., Screening Test for Auditory Processing Disorders [SCAN] [Keith, 1986], Staggered Spondaic Word Test [Katz, 1986], Willeford battery of CAP tests [Willeford, 1977]).

Further analysis of data collected during this study may be conducted to assist in providing a more comprehensive profile of students' CAP abilities and functional levels. More specifically, application of statistical analysis in the following areas may provide useful and critical information for au-

diologists involved in CAP evaluation of children:

- Ear effect scores (double errors for the same ear)
- Order effect scores (first response ear)
- Error pattern analysis (e.g., position of error or deleted digits, response pattern, reversals).

DDT norms obtained for this subject sample should be very appropriate for students residing in similar geographic areas. However, audiologists should use caution when applying these norms in other regions of the state or nation if the demographics are notably different from the sample used in this investigation.

Table 6. Summary of mean ear difference scores and standard deviations (SD) for eight age groups of children.

Age Range	Mean Ear Difference Score	SD
5.0-5.11	7.4	9.4
6.0-6.11	12.8	4.1
7.0-7.11	12.6	5.9
8.0-8.11	9.4	3.1
9.0-9.11	6.6	4.5
10.0-10.11	7.9	4.6
11.0-11.11	4.5	6.9
12.0-12.11	5.6	3.9

SUMMARY

Normative data were obtained for a pediatric population (5.0-12.11 years, N=200) using the Dichotic Digits Test. In all instances the mean percent score was slightly (.50) to moderately (6.28) higher than norms available from the test's developer. The availability of more sufficient normative data will allow audiologists to interpret a child's DDT results more confidently. Further statistical analysis of data

compiled during this study would expand the flexibility of this dichotic test with regard to ease of interpretation. The DDT is a valuable component in the audiologist's CAP test battery and the availability of a more complete array of normative data should enhance its use with the pediatric population.

ACKNOWLEDGMENT

Portions of this manuscript were presented in a poster session at the 1996 Florida

Association of Speech-Language Pathologists and Audiologists (FLASHA) annual convention, Ft. Lauderdale, FL.

REFERENCES

- American Speech-Language-Hearing Association (1996). Central auditory processing: Current status of research and implications for clinical practice. *American Journal of Audiology*, 5 (2), 41-54.
- Bellis, T. (1996). *Assessment and Management of Central Auditory Processing Disorders in the Educational Setting*. San Diego, CA: Singular Publishing Group.
- Broadbent, D. (1954). The role of auditory localization in attention and memory span. *Journal of Experimental Psychology*, 47, 191-196.
- Hutchison, T. (1996). What to look for in the technical manual: Twenty questions for users. *Language, Speech, Hearing Services in Schools*, 27 (2), 109-121.
- Katz, J. (1986). *The SSW Test Manual* (3rd ed.). Vancouver, WA: Precision Acoustics.
- Keith, R. (1986). *SCAN: Screening Test for Central Auditory Processing Disorders*. San Antonio, TX: Psychological Corp.
- Kimura, D. (1961). Some effects of temporal lobe damage on auditory perception. *Canadian Journal of Psychology*, 15, 157-165.
- Mueller, H. & Bright, K. (1994). Monosyllabic procedures in central testing. In J. Katz (Ed.) *Handbook of Clinical Audiology* (4th ed) (pp. 222-238). Baltimore, MD: Williams & Wilkins.
- Musiek, F. (1983a). Assessment of central auditory dysfunction: The dichotic digits test revisited. *Ear and Hearing*, 4, 79-83.
- Musiek, F. (1983b). (audiotape) *Dichotic Digits Test*. Hanover, NH: Dartmouth-Hitchcock Medical Center.
- Musiek, F. & Lamb, L. (1994). Central auditory assessment: An overview. In J. Katz (Ed.) *Handbook of Clinical Audiology* (4th ed.) (pp. 197-211). Baltimore, MD: Williams & Wilkins.
- Musiek, F., Gollegly, K., Kibbe, K. & Verkest-Lenz, S. (1991). Proposed screening test for central auditory disorders: Follow-up on the dichotic digits test. *American Journal of Otology*, 12 (2), 109-113.
- Musiek, F., Gollegly, K., Lamb, L. & Lamb, P. (1990). Selected issues in screening for central auditory processing dysfunction. In *Seminars in Hearing*, 11 (4), 372-384.
- Stecker, N. (1992). Central auditory processing: Implications in audiology. In J. Katz, N. Stecker & D. Henderson (Eds.) *Central Auditory Processing: A Transdisciplinary View* (pp. 117-127). St. Louis, MO: Mosby Year Book, Inc.
- Willeford, J. (1977). Assessing central auditory behavior in children: A test battery approach. In R. Keith (Ed.) *Central Auditory Dysfunction* (pp. 43-72). New York, NY: Grune & Stratton.

Contact Author:

Gail Gegg Rosenberg, M.S., CCC-A
School Board of Sarasota County
1705 Wharf Road
Sarasota, FL 34231
e-mail: geggrose@aol.com

BEST COPY AVAILABLE

APPENDIX

Dichotic Digits Test (DDT) Worksheet
 devised for the collection of local norms for children.

The School Board of Sarasota County, Florida
Audiological Services
Dichotic Digits Test (Musiek, 1983) Worksheet

Name _____ DOB _____ Date _____

CA _____ Grade _____ Examiner _____

LE: Channel 1, RE: Channel 2

Single Digit Test Practice Items				Double Digit Test Practice Items							
Left Ear		Right Ear		Left Ear				Right Ear			
5			2	5	4					2	1
1			8	8	3					6	4
3			10	2	8					3	5

Test Items				Test Items							
1			7	6	1					8	2
8			3	2	5					10	4
2			6	4	3					9	5
3			4	8	6					3	1
1			3	9	2					4	6
7			5	3	10					2	4
5			3	5	8					1	10
1			2	2	9					5	3
3			10	10	5					4	9
10			7	1	9					6	4
6			2	3	1					8	6
4			9	5	3					2	9
8			1	2	4					3	10
3			5	8	2					6	1
8			10	10	4					2	5
6			2	9	5					4	3
9			4	4	9					10	5
1			9	6	4					1	9
2			8	1	10					5	8
10			3	4	6					9	2
LE Score			RE Score	LE Score						RE Score	

(over)

Dichotic Digits Test (Musiek, 1983) Worksheet

Name _____

CA _____

	Score	Relationship to Mean
Left Ear	/40 = %	
Right Ear	/40 = %	
Mean Ear Difference Score		

Sarasota County, Florida Norms*

Age	Left Ear				Right Ear				Mean Ear Difference Score	SD
	Mean	SD	-1SD	-2SD	Mean	SD	-1SD	-2SD		
5.0-5.11	52.5%	7.1	45.4%	38.3%	69.9%	9.8	60.1%	50.3%	17.4%	9.4
6.0-6.11	58.7%	9.9	48.8%	38.9%	71.5%	9.9	61.6%	51.7%	12.8%	4.1
7.0-7.11	61.3%	8.3	53.0%	44.7%	73.9%	8.5	65.4%	56.9%	12.6%	5.9
8.0-8.11	70.6%	8.2	62.4%	54.2%	79.9%	8.2	71.7%	63.5%	9.4%	3.1
9.0-9.11	75.1%	7.0	68.1%	61.1%	81.7%	8.0	73.7%	65.7%	6.6%	4.5
10.0-10.11	78.4%	6.8	71.6%	64.8%	86.3%	6.8	79.5%	72.7%	7.9%	4.6
11.0-11.11	88.1%	7.1	81.0%	73.9%	92.6%	4.3	88.3%	84.0%	4.5%	6.9
12.0-12.11	90.7%	5.7	85.0%	79.3%	96.2%	4.1	92.1%	88.0%	5.6%	3.9

Raw Score Conversion Chart

Raw Score	%	Raw Score	%	Raw Score	%	Raw Score	%
1	2	11	28	21	52	31	78
2	5	12	30	22	55	32	80
3	8	13	32	23	58	33	82
4	10	14	35	24	60	34	85
5	12	15	38	25	62	35	88
6	15	16	40	26	65	36	90
7	18	17	42	27	68	37	92
8	20	18	45	28	70	38	95
9	22	19	48	29	72	39	98
10	25	20	50	30	75	40	100

*Rosenberg, G. (1996, May). *Child Norms for the Dichotic Digits Test (DDT)*. Poster presentation at the Florida Association of Speech-Language Pathologists and Audiologists annual convention, Ft. Lauderdale, FL.

Screening Kindergarten Children to Assess Risk for Reading Difficulties

Laurie M. Gauger, Linda J. Lombardino and Shireen Pinheiro
University of Florida
Gainesville, FL

Kindergarten teachers trying to identify children at-risk for reading failure need a tool that can be administered quickly and that has high predictive validity. This paper describes a longitudinal study to further examine the predictive validity of the half version of the Early Reading Screening Instrument (ERSI; Morris, 1992) along with two other variables, rapid naming and phonological awareness. Fifty-five kindergarten children (28 boys, 27 girls, mean age 6.2 years) were given the half-ERSI, and a battery of phonological awareness and rapid naming tasks. One year later, at the end of their first grade year, 39 of the 55 children were administered standardized reading and spelling tests (21 boys, 18 girls, mean age 7.2 years). The results of this study indicate that the half-ERSI given in kindergarten most strongly correlated with first grade reading and spelling abilities. Based on the results of this study and previously reported data, we conclude that the half-ERSI is a reliable and valid measure of reading readiness and is a valuable screening instrument for kindergarten teachers. Implications for early identification and treatment are discussed.

Thousands of children experience significant difficulties in learning to read and are diagnosed as having a specific reading disability each year. For many reading disabled children, a diagnosis based on poor performance on tests for reading achievement comes after struggling with learning to read for several years and often occurs too late for optimal progress in standard school-based reading intervention programs. In an attempt to limit reading failure and the negative consequences associated with this failure, researchers and practitioners have focused on the early identification of reading disabilities. Children at-risk for reading difficulties can be identified before the actual process of reading instruction begins, since the skills that precede and develop concurrent with reading have been identified in numerous studies and have been found to predict later reading proficiency. Research demonstrates that some aspects of speech sound awareness (e.g., awareness of rhyme or syllables) are acquired before formal reading instruction begins and that differences in this awareness influence reading development. For example, Share, Jorm, MacLean and Matthews (1984) have reported that measures of phonological awareness in kindergarten are strong predictors of reading ability in first grade. Additional studies, like Catts (1991) and Magnusson and Naucler (1990), suggest that poor phonological awareness in the preschool and kindergarten years may be an early indicator of a reading disability. Children who begin reading instruction without adequate knowledge of these pre-literacy skills are likely to experience great difficulty in learning to read and may never achieve skilled reading.

During the past decade, reading research has focused on identifying these pre-literacy skills and determining their impact on the development of reading (Blachman, 1984a, 1984b, 1994; Catts, 1991; Ehri, 1989; Goswami & Bryant, 1992; Hohn & Ehri, 1993; Mann, Tobin & Wilson, 1987; Share et. al., 1984; Torgesen, Wagner & Rashotte, 1994; Stanovich, Cunningham & Cramer, 1984). Results of numerous studies delineate successful and efficient ways to identify and remediate children at-risk for reading problems even before formal reading instruction begins and that early reading achievement is strongly predicted by specific skills including phoneme analysis and synthesis, rapid naming, alphabet knowledge and concept of word (Ball & Blachman, 1988; Blachman, 1991; Bradley

& Bryant, 1985; Denckla & Rudel, 1976a; Denckla, Rudel & Broman, 1981; Helfgott, 1976; Lewkowitz, 1980; Morris & Perney, 1984; Tangel & Blachman, 1992; Torgesen et. al., 1994; Wolf, 1984; Wolf, Bally & Morris, 1986; Wolf & Goodglass, 1986).

Phonological awareness is acquired developmentally and refers to the abilities required to recognize and manipulate phonological units such as syllables and phonemes. Early forms of phonological awareness include a sensitivity to syllabic and intrasyllabic units such as in tasks of syllable detection and rhyming. A more advanced form of phonological awareness is phonemic awareness. Tasks used to measure phonemic awareness include phoneme counting and phoneme segmentation (Morais, 1991; Tunmer & Hoover, 1992; Tunmer & Rohl, 1991). Whereas phonological awareness requires a sensitivity to syllabic units, phonemic awareness requires a sensitivity to a much smaller phonological unit, the phoneme. Invented spelling, a task that requires the expression of phonemic knowledge through orthography, is an excellent means for assessing phonemic awareness in pre-reading children because pre-readers do not have visual images of words fixed in memory. Thus, children's invented spellings reflect their knowledge of the phonemic structure of the language (Morris & Perney, 1984; Read, 1971).

Regardless of how phonological awareness is measured, results from numerous studies show that this sensitivity to the sound structure of one's language is related to success in learning to read (Adams, 1990; Blachman, 1984a; Clarke, 1988; Ehri & Wilce, 1985; Lundberg, Olofsson & Wall, 1980; Stanovich, et. al., 1984; Wagner & Torgesen, 1987). Torgesen et. al. (1994) report correlations between .40 and .60 for children's phonological awareness abilities assessed in kindergarten and their word-reading skills at the end of first grade. Delayed development of phonological awareness is commonly found in children with developmental reading disorders (Alexander, Anderson, Heilman, Voeller & Torgesen, 1991; Bradley & Bryant, 1978; Gough & Tunmer, 1986; Lombardino, Riccio, Hynd & Pinheiro, 1997).

The ability to access phonological information stored in long-term memory is another skill shown to be strongly predictive of later reading performance (Bowers, Steffy & Tate, 1988; Denckla et. al., 1981; Wolf, 1984, 1991; Wolf et. al., 1986).

Torgesen et. al. (1994) state that "the efficiency with which children can access phonological codes associated with letters, word segments and whole words influences the extent to which phonological information is useful in decoding" (pp. 277). The ability to access phonological information has typically been assessed in the reading literature by rapid naming tasks. Difficulties in rapid naming in children with developmental reading disabilities was described years ago by Denckla and Rudel (1976a). In tasks of rapid naming, an individual is required to name familiar stimuli such as colors, objects and letters as quickly and accurately as possible in a series of 30-50 items. Poor performance on automatic naming tasks has been shown to parallel and predict poor performance in reading and differentiate children with dyslexia from controls and from children with other developmental learning disabilities (Denckla & Rudel, 1976a).

Children's knowledge of the alphabet letters, that is, their ability to name and write the letters of the alphabet, has been found to be another strong predictor of reading. Share et. al. (1984) found that letter knowledge at the beginning of kindergarten was once of the best predictors of reading achievement at the end of first grade. Moreover, Ehri and Wilce (1985) and Masonheimer, Drake and Ehri (1984) found that mastery of letters distinguished beginning readers who were able to learn to read words effectively from those who were not. According to Ehri (1987), knowledge of letters provides the basis for forming connections between the letters seen in spellings and the sounds detected in pronunciation and for storing these associations in memory in order to remember how to read those words when they are seen again.

One of the earliest forms of reading among preschool children has been referred to as pretend reading or emergent storybook reading (Sulzby, 1985). In this stage of pre-reading, children turn the pages of a book they have heard many times and recite the story from memory. In an advanced form of pretend reading, finger-point reading, children point to words as they recite the text from memory. Some educators have argued that this type of practice is essential for beginning readers to come to understand how print is structured to correspond to speech at the word and letter levels (Mason & Allen, 1986; Mason, Kerr, Sinha & McCormick, 1990). Students who can finger-point read are said to have achieved a

"concept of word" and have shown to be better prepared for reading instruction than students without this skill (Mason, et. al., 1990; Morris & Henderson, 1981).

Morris (1992) developed a screening instrument that kindergarten teachers can use to identify children at-risk for reading failure that assesses many of these skills. The instrument, the Early Reading Screening Instrument (ERSI), assesses four areas related to reading acquisition and has been found to be predictive of reading ability at the end of first grade (Lombardino, et. al., in press; Morris, 1992). The ERSI is comprised of four scales: Alphabet Knowledge, Concept of Word, Invented Spelling and Single Word Recognition. Local norms have been collected on the ERSI at two sites. Morris (1992) administered the ERSI to 100 children in rural North Carolina. Lombardino et. al. (in press) administered the ERSI to 149 children from five public schools in Gainesville, Florida in a two-year study. Both studies found several significant correlations between the children's first ERSI scores in the latter part of their kindergarten year and their scores on the Word Identification, Word Attack and Passage Comprehension subtests from the Woodcock Reading Mastery Tests - Revised (WRMT-R; Woodcock, 1987) administered at the end of first grade. Specific findings from Lombardino and colleagues include (a) the total ERSI scores (all subtests combined) correlated highly with all three of the WRMT-R subtests used to assess reading skill; (b) the highest correlation was between the ERSI total score and Passage Comprehension ($r=.73$); (c) significant correlations for all ERSI subtests and the three subtests from the WRMT-R with only two exceptions (neither Alphabet Knowledge nor Concept of Word correlated with the Word Attack reading subtest); and (d) when each subtest of the ERSI was divided in half to investigate the validity of a shortened version of the instrument, individual subtest scores for each of the two halves highly correlated with the full ERSI subtest scores, with correlation coefficients ranging between .85 - .97. Based on these results, the authors determined that the half-ERSI would be a valid and efficient screening measure.

This investigation was carried out in two phases over a one-year period and addressed the following question: Which measures, including the half-ERSI, the phonological awareness tasks and the naming tasks, given in kindergarten best predict first

grade reading and spelling ability?

METHODS

Subjects

In the first phase of the study, 55 children (28 boys, 27 girls) between the ages of 5.2 and 7.5 years (mean age = 6.2 years) participated as subjects. These children comprised the kindergarten population (two classrooms) in an elementary school in north central Florida. All subjects were first-time kindergartners, native English speakers and showed evidence of normal visual, hearing, motor and cognitive abilities as indicated by school records. One year later, 39 of the original 55 children were included in Phase II of the study. The final sample included 21 boys and 18 girls with a mean age of 7.2 years.

Test Battery

All tests administered in Phase I and II were administered in random order. Students were administered each phase of testing in one session unless they expressed or demonstrated fatigue during the testing session. When testing needed to be completed in two sessions, the same examiner administered both sessions of testing. All tests were administered and scored by graduate students in speech-language pathology or a certified speech-language pathologist, all of whom had experience with the given tests. All testing was rescored by the certified speech-language pathologist for accuracy.

Phase I

In April, toward the end of their kindergarten year, the children were given the half-ERSI, and a battery of phonological awareness and rapid naming tasks. The four subtests of the half-ERSI were administered: Alphabet Knowledge (the student is required to name 13 upper and 13 lower case letters and write 13 alphabet letters as they are dictated in random order by the examiner), Concept of Word (the student is required to finger-point read and identify target words in three related sentences), Invented Spelling (the student is required to write out the spellings of five words) and Word Recognition (the student is required to read a list of five decodable words and five sight words). A copy of the half-ERSI, along with the directions for administration and scoring can be found in the Lombardino et. al. (in press) paper.

The four subtests from the Comprehensive Test of Phonological Processing (Torgesen & Wagner, 1994) with normative

data for kindergarten children were administered. Each subtest examined a different type of phonological awareness skill. Instructions and responses for all subtests were provided orally. The Elision task requires the child to say a word after the examiner and then to say the same word without a given syllable or phoneme (e.g., "Say TULIP. Now say TULIP without saying LIP" or "Say CUP. Now say CUP without saying the /k/ sound.") The Sound Matching subtest requires the child to choose the word from a choice of three that begins or ends with the same sound as the target word (e.g., "Which word begins with the same sound as PAN? PIG, HAT or CONE?"). The Sound Categorization task requires the child to decide from a choice of three words the word that does not sound like the others (e.g., "Which word does not sound like the others: BAT, FIT, CAT?"). The Phoneme Blending task requires the child to blend phonemes and phoneme sequences to make words and nonwords (e.g., "What word do these sounds make: hamm-er?" or "What made-up word do these sounds make: p-og?").

Finally, the Colors and Objects subtests of the Rapid Automatized Naming test (RAN; Denckla & Rudel, 1976b) were administered. The RAN requires the subject to name, as rapidly and accurately as possible, a series of 50 items in five rows or 10 on a single plate. Scores are determined for speed and accuracy.

Phase II

One year later, at the end of their first grade year, the children were administered standardized reading and spelling tests. Three subtests from the WRMT-R were administered to assess reading ability. The Word Identification subtest requires the subject to identify isolated words that appear in a test book within five seconds. The Word Attack subtest measures the subject's ability to apply phonics rules to pronounce unfamiliar nonsense words. The Passage Comprehension subtest measures the subject's ability to read a short passage and provide a key word missing from the passage. The Spelling subtest from the Wide Range Achievement Test-Revised Level I (WRAT-R; Jastak & Wilkinson, 1984) was used to assess spelling ability. This subtest has three parts for which the child can receive points. In the first part, the child is asked to copy marks into empty boxes located under each mark. In the second part, the child is required to write his first and last name. In

Table 1. Mean scores and standard deviations (SD) for the half-ERSI given to subjects in kindergarten (n = 55).

	Mean	SD
Total half-ERSI Score	24.69	8.13
Alphabet Knowledge	9.11	1.64
Concept of Word	8.00	2.32
Invented Spelling	5.27	2.85
Word Recognition	2.30	3.10

Note. ERSI = Early Reading Screening Instrument (Morris, 1992). Word recognition of decodeable words and sight words were collapsed into the category Word Recognition. Maximum score for the Total half-ERSI is 40 and the maximum score for each subtest is 10. Scores are calculated by dividing the number correct by the number possible and multiplying by 10.

Table 2. Mean scores (number correct) and standard deviations (SD) for the phonological awareness tasks and the rapid naming tasks given to subjects in kindergarten (n = 55).

	Mean	SD
Phonological Awareness Tasks		
Elision	7.60	3.35
Sound Matching	10.50	4.25
Sound Categorization	10.85	3.22
Blending	14.47	9.79
RAN		
Objects	82.46	29.15
Colors	69.64	24.67

Note. Phonological awareness tasks are from the Comprehensive Tests of Phonological Processing (Torgesen & Wagner, 1994); RAN = Rapid Automatized Naming (Denckla & Rudel, 1976b). Nonword and word blending were combined to yield Blending scores. Matching beginning and ending sounds were combined to yield Sound Matching scores.

Table 3. Means and standard deviations (SD) for the Word Identification, Word Attack and Passage Comprehension subtests of the WRMT-R and the Spelling subtest from the WRAT-R given to all subjects in first grade (n = 39).

	Mean	SD
WRMT-R		
Word Identification	103.97	15.85
Word Attack	100.64	13.50
Passage Comprehension	102.05	12.77
WRAT-R		
Spelling	97.13	16.47

Note. WRMT-R = Woodcock Reading Mastery Tests - Revised (Woodcock, 1987); WRAT-R = Wide Range Achievement Test - Revised Level I (Jastak & Wilkinson, 1984).

the third part, the child is provided a word auditorily and required to provide the spelling for that word.

Reliability and Data Analysis

A certified speech-language pathologist observed administration and scoring of the entire test battery for 20% of the children included in the study. Interrater reliability was over 95% for all scored tests. The Spearman Rank Correlation procedure was used to test relationships between the half-ERSI, phonological awareness tasks and naming tasks administered to the subjects in kindergarten and their scores on the three reading tests and the spelling test administered in the first grade. Multiple regression analysis was also performed to predict which combination of the above stated tasks best predict reading and spelling abilities in first grade. Level of significance was set at .01 with a 95% confidence interval.

RESULTS

Normative Data for Pre-Reading Task and Standardized Reading and Spelling Tests

Mean scores for all tests administered

during Phase I of the study are provided in Tables 1 and 2. Data is reported for the 55 kindergarten children who participated in Phase I of testing. Mean standard scores for the reading and spelling tests administered in Phase II are provided in Table 3. Data are reported for the 39 first grade children who participated in Phase II of testing. All mean scores were within the normal limits based on available normative data.

Correlational Analyses for Pre-Reading Tasks in Kindergarten and Reading and Spelling Abilities in First Grade

Results from the half-ERSI, the four phonological awareness tasks and the RAN given in kindergarten were correlated with the results from the Word Identification, Word Attack and Passage Comprehension subtests of the WRMT-R and the Spelling subtest from the WRAT-R given to these same children at the end of their first grade year. In addition, scores from the WRMT-R subtests and the WRAT-R subtest were combined to yield a Total Reading score. The Total Reading score was also correlated with the half-ERSI, RAN and the phonologi-

cal awareness tasks. Table 4 shows the correlational data for these variables.

Word Identification subtest of the WRMT-R

The half-ERSI total score had a significant moderate correlation with Word Identification ($r=.52$). All subtests of the half-ERSI, except Concept of Word, significantly correlated with Word Identification, with correlation coefficients ranging between .41 - .46. The Invented Spelling subtest most strongly correlated with Word Identification ($r=.46$), followed closely by Word Recognition ($r=.45$) and Alphabet Knowledge ($r=.41$). Of the four phonological awareness tasks given, only Sound Matching demonstrated a significant moderate relationship with Word Identification ($r=.43$). The RAN subtests did not significantly correlate with Word Identification.

Word Attack subtest of the WRMT-R

The half-ERSI total score correlated significantly with nonword decoding skills ($r=.46$). Of the four subtests of the half-ERSI, only Word Recognition significantly

Table 4. Correlations between the half-ERSI, phonological awareness tasks and the RAN scores administered in kindergarten and standardized reading and spelling scores administered in first grade (n = 39).

	WI	WA	PC	SP	TR
Half-ERSI					
Total half-ERSI	.520*	.463*	.617*	.386	.540*
Alphabet knowledge	.414*	.271	.436*	.232	.368
Concept of Word	.357	.206	.415*	.16	.308
Invented Spelling	.455*	.381	.499*	.326	.453*
Word Recognition	.448*	.541*	.597*	.449*	.553*
Phonological Awareness Tasks					
Elision	.319	.379	.441*	.274	.382
Sound Matching	.429*	.459*	.545*	.400	.499*
Sound Categorization	.349	.229	.444*	.193	.328
Blending	.278	.238	.357	.037	.240
RAN					
Colors	-.248	-.262	-.294	-.265	-.293
Objects	-.392	-.403	-.496*	-.465*	-.482*

Note. * $p < .01$. RAN = Rapid Automatized Naming (Denckla & Rudel, 1976b); Phonological awareness tasks taken from the Comprehensive Tests of Phonological Processing (Torgesen & Wagner, 1994); ERSI = Early Reading Screening Instrument (Morris, 1992). WI (Word Identification), WA (Word Attack), and PC (Passage Comprehension) subtests from the Woodcock Reading Mastery Tests - Revised (Woodcock, 1989); SP (Spelling) subtest from the Wide Range Achievement Test - Revised Level 1 (Jastak & Wilkinson, 1984). TR = Total Reading. TR is the combination of the WRMT-R subtests and WRAT-R subtest.

correlated with nonword decoding ($r=.54$). Concept of Word and Alphabet Knowledge subtests did not correlate with word attack skills, a finding that was expected since the kindergarten children were functioning close to ceiling levels on both of these subtests. For the phonological awareness tasks, again only the Sound Matching subtest correlated significantly with decoding skills ($r=.46$). The RAN did not significantly correlate with word attack skills.

Passage Comprehension subtest of WRMT-R

The total score from the half-ERSI demonstrated a high moderate significant correlation with reading comprehension ($r=.62$). All of the half-ERSI subtests significantly correlated with reading comprehension, with coefficients ranging between .42 - .60. Of the half-ERSI subtests, Word Recognition correlated most strongly with reading comprehension ($r=.60$). Of the phonological awareness tasks, Elision ($r=.44$), Sound Matching ($r=.55$) and Sound Categorization ($r=.44$) significantly correlated with reading comprehension. The RAN Objects subtest had a significant moderate negative correlation with reading comprehension ($r=.50$), indicating that faster object naming times (faster time = smaller number in seconds) was associated with better reading comprehension scores.

Spelling subtest of the WRAT-R

The half-ERSI total score did not significantly predict spelling ability. Of the four half-ERSI subtests, only Word Recognition demonstrated a significant relationship with Spelling ($r=.45$). None of the phonological awareness tasks demonstrated a significant relationship to spelling. The RAN Objects subtest demonstrated a significant moderate negative correlation with spelling ($r=.47$).

Total Reading

The Total Reading score is the combination of the reading and spelling subtests. The half-ERSI total score had a significant moderate correlation with Total Reading ($r=.54$). Of the half-ERSI subtests, the Invented Spelling ($r=.45$) and Word Recognition ($r=.55$) subtests significantly correlated with Total Reading. For the phonological awareness tasks, Sound Matching correlated significantly with Total Reading ($r=.50$). The RAN Objects subtest had a significant moderate negative correlation with Total Reading ($r=.48$).

Table 5. Correlations between the half-ERSI and the RAN and phonological awareness tasks administered in kindergarten ($n = 55$).

	R-C	R-O	EL	SM	SC	BL
Total ERSI	-.194	-.267	.709*	.758*	.457*	.787*
Alpha Know	-.099	-.128	.283	.406*	.423*	.341
Concept Wd	.042	-.026	.494*	.565*	.437*	.612*
Invent Sp	-.291	-.386*	.682*	.704*	.397*	.780*
Wd Rec	-.220	-.296	.711*	.700*	.281	.706*

Note. * $p < .01$. ERSI = Early Reading Screening Instrument (Morris, 1992) - Alpha Know (alphabet knowledge), Concept WD (concept of word), Invent Sp (invented spelling), and Wd Rec (word recognition); RAN = Rapid Automatized Naming (Denckla & Rudel, 1976b) - R-C (RAN Colors subtest) and R-O (RAN Objects subtest); EL (Elision), SM (Sound Matching), SC (Sound Categorization) and BL (Blending) subtests from the Comprehensive Tests of Phonological Processing (Torgesen & Wagner, 1994).

Correlation Between the Half-ERSI and the Phonological Awareness Task and the Rapid Naming Tasks

The half-ERSI scores were also correlated with RAN and the phonological awareness tasks. Table 5 shows the correlational data for these variables. Most of the half-ERSI total scores and subtest scores correlated significantly with the four phonological awareness tasks, with coefficients ranging between .40 - .79. A significant negative correlation was observed between the Invented Spelling subtest scores of the half-ERSI and the RAN Object scores ($r=.39$), indicating that better invented spelling scores were related to faster RAN times.

Regression Analysis

A regression analysis was performed to develop a statistical model that would best predict the Total Reading scores in first grade. Table 6 shows the regression data. The purpose of this analysis was to predict reading and spelling scores from a linear weight combination of such predictors as the RAN, the phonological awareness tasks and the half-ERSI. If a particular independent variable makes a greater contribution to the dependent variable, in this case the Total Reading score, than does another independent variable, it is weighted more heavily. A child high on an important independent variable would obtain a higher criterion score than a child with the reverse combination. Total Reading is the combination of the WRMT-R reading subtest scores and the WRAT-R Spelling subtest score. It was found that Word Recognition, Sound Cat-

egorization, Blending and RAN Objects best predicted the Total Reading scores in first grade. The adjusted R^2 was moderate (.42). The regression equation that can be used to best predict the reading and spelling scores is Total Reading = $422.23 + 9.04$ (Word Recognition) + 5.95 (Sound Categorization) - 1.73 (Nonword Blending) - 1.12 (RAN Object). Word Recognition accounted for most of the variance in the Total Reading score, followed by Sound Categorization. Nonword Blending and RAN Object scores accounted for much less of the variance. It should be noted that Nonword Blending, not Word Blending, contributed to the regression model. When Nonword Blending and Word Blending were put into the model separately, Word Blending did not show up in the "best" model. Stepwise regression analysis confirmed the above model.

DISCUSSION

This study was undertaken in response to a need for kindergarten teachers to be able to easily and reliably identify children at-risk for reading failure. While previous research during the last decade has already clearly indicated that all of the measures examined in this study reliably predict future reading and spelling ability, none of these measures has been compared in the same study to identify the one measure (or measures) that has the greatest predictive value. In the current study, we administered the half-ERSI, four phonological awareness tasks and the RAN to kindergarten students to determine their relationship to first grade reading and spelling. The results indicate

Table 6. Regression analyses for the half-ERSI, RAN and phonological awareness tasks on the reading and spelling subtests.

Dependent Variable	Independent Variable	Adjusted R ²
Total Reading	Word Recognition	.287
	Word Recognition + RAN Objects	.359
	Word Recognition + Sound Categorization + RAN Objects	.390
	Word Recognition + Sound Categorization + Nonword Blending + RAN Objects	.422

Note. Total Reading = combination of the Woodcock Reading Mastery Tests - Revised (Woodcock, 1987) subtests and Wide Range Achievement Test - Revised Level 1 (Jastak & Wilkinson, 1984) Spelling subtest.

that the half-ERSI most strongly correlated with first grade reading and spelling abilities. This finding is consistent with findings from Lombardino et. al. (in press) and Morris (1992). While we examined three skills involved in reading, including single word recognition, decoding and reading comprehension, almost all of the skills examined in kindergarten had the strongest relationship with first grade reading comprehension. This is a critical point since the ultimate goal of reading is comprehension.

Furthermore, these findings underscore the importance of orthographic knowledge in learning to read. The subtests of the half-ERSI assess knowledge of orthography, whereas the phonological awareness and rapid naming tasks do not. Our findings suggest that screening tests that tap orthographic knowledge predict later reading and spelling abilities better than screening tests that sample some of the prerequisites for reading and spelling, such as phonological awareness and rapid naming.

The half-ERSI measures four skills that have proven to be reliable predictors of later reading ability in numerous studies over the last decade, including one measure of phonemic awareness, invented spelling. Since other measures of phonological processes have also been found to demonstrate a strong relationship to future reading and spelling abilities, it is important to know whether the half-ERSI correlates well with these other skills. Strong correlation between the half-ERSI and these other variables would reinforce the strength of the half-ERSI as a reliable and valid screening tool for at-risk children. Scores from the half-ERSI were correlated with rapid naming tasks and phonological awareness tasks.

The kindergarten children in this study named colors more rapidly and accurately than objects, however, the only significant relationship observed between the half-ERSI and the RAN was between the Invented Spelling subtest of the half-ERSI and the RAN Object subtest. Here a moderate negative correlation was found indicating that children with better phonemic awareness skills could name objects faster. It may be that for the kindergarten children in this study, more difficulty was associated with rapidly accessing the phonological codes associated with object names than color names because colors are taught throughout the kindergarten year. It is also possible that another reason that color naming was accomplished more rapidly and accurately than object naming may be the limited number of colors as opposed to objects included in the RAN. Because of the increased level of difficulty experienced in rapidly naming objects for the kindergarten children, this task may be a more sensitive indicator of the level of difficulty the child will experience when retrieving phonological information in reading.

Correlations between the half-ERSI and phonological awareness skills were within the moderate to high-moderate range. The highest correlations were noted between the half-ERSI Total Score, Invented Spelling subtest score and Word Recognition subtest score and Elision, Sound Matching and Blending scores. Correlations were not as high between the half-ERSI and the Sound Categorization subtest. The overall group mean for the Sound Categorization task was substantially higher than the group means for Elision, Sound Matching and Blending subtests, consistent with Torgesen and

Wagner (1994) data, indicating that this type of phonological awareness skill is easier than the skills necessary to complete Elision or Sound Matching tasks, probably because Elision and Sound Matching require a more specific sensitivity to phonemes. The data here suggest that the Sound Categorization task did not sufficiently stress the phonological processing system to identify children who were likely to have difficulties using phonological information necessary for reading and spelling. Because of the crucial role that phonological awareness plays in reading acquisition, these significant correlations between the half-ERSI and phonological awareness strengthen the validity of the half-ERSI as a kindergarten screening instrument to identify children who do not have the necessary skills to successfully learn to read.

The mean scores obtained in this study of the half-ERSI are consistent with mean scores obtained from the split-half analyses performed in the Lombardino et. al. (in press) study of 72 children and are consistent with published norms for the full ERSI (Lombardino, et. al., in press; Morris, 1992). The mean scores for the reading and spelling tests administered in first grade are also within normal limits based on standardized norms. Comparison of the correlations obtained in this study and in the Lombardino et. al. (in press) study between the half-ERSI and later reading, however, reveals inconsistencies between the two studies. Whereas Lombardino and colleagues obtained significantly high moderate to high correlations between all subtests of the half-ERSI and later reading skills, the current study did not. In the present study, significant moderate correlations were noted between the Total half-ERSI scores and reading skills in the first grade. Whereas all of the half-ERSI subtests significantly correlated with Passage Comprehension and all but Concept of Word significantly correlated with Word Identification, only the Word Recognition subtest of the half-ERSI correlated with Word Attack. Similar to the Lombardino et. al. (in press) results, however, the strongest correlations were found between the half-ERSI and reading comprehension. One explanation for the discrepancy in results between the studies is the difference in sample size. The half-ERSI correlations in the Lombardino et. al. study are based on scores from 72 children, whereas the scores from 39 children were included in the correlational analyses in the current study. Also

contributing to the discrepancy in the findings is the subject pool of the current study. All of the kindergarten children in a given school participated as subjects ($n = 55$). However, only 39 of the original 55 children were given the standardized reading and spelling measures at the end of first grade. Sixteen children could not participate in the second phase because seven children moved and nine other children participated in phonological awareness training. Post hoc analyses revealed that half of these 16 children performed more than one standard deviation below the mean on the phonological awareness tasks and one third of these children performed more than one standard deviation below the mean on the Total score of the half-ERSI.

Phonemic awareness is an advanced form of phonological awareness and requires specific sensitivity to individual phonemes contained in words. Tasks that assess phonemic awareness include invented spelling and nonword decoding, two skills assessed with the half-ERSI. Results of recent studies suggest that deficits in phonemic awareness may more severely affect reading performance than deficits in other phonological processing skills. For example, studies have suggested the double-deficit hypothesis which states that combinations of deficits in rapid naming and phonemic awareness affect reading abilities differently (Bowers & Wolf, 1993; Krug, 1996). Krug (1996) divided a group of fifth graders into four subgroups based on rapid naming speed and nonword decoding skill to investigate the double-deficit hypothesis. The four groups included the double-asset group (good phonemic awareness and rapid naming speed), double-deficit group (poor phonemic awareness and rapid naming speed), phonological-deficit group (poor phonemic awareness and good rapid naming speed) and the rate-deficit group (good phonemic awareness and poor rapid naming speed). She found that the double-asset group demonstrated the best reading and cognitive skills in all four groups, whereas the double-deficit group demonstrated the poorest reading and cognitive abilities. The phonological-deficit group performed better than the double-deficit group on reading and cognitive abilities but were poorer than the rate-deficit group. Krug concluded that the profile associated with the children in the double-deficit group is most consistent with severely impaired readers. Whereas the children included in the single-deficit

groups were most consistent with moderately impaired readers, the children with only poor phonemic awareness were at a disadvantage over the children with only poor rapid naming speeds in reading and spelling. These results suggest that whereas deficits in phonemic awareness and rapid naming are associated with impaired reading and spelling abilities, deficient phonemic awareness leads to poorer reading and spelling abilities than poor rapid naming. These findings further support the use of the half-ERSI as a reliable measure to detect children at-risk for reading failure as it contains a measure of phonemic awareness.

We could not examine the relationship between the double-deficit hypothesis and reading ability in this study because not enough of the children who participated in the first grade reading testing represented each of the four deficit groups. We did however group the children based on naming speed and phonological awareness. It is interesting to note that out of the nine children that comprised the double-deficit group and the phonological-deficit group, six had been identified as at-risk for reading difficulties by school personnel and were receiving phonological awareness intervention. The two children that comprised the rate-deficit group were not demonstrating reading difficulty as determined by their classroom teacher.

It is interesting to note that the Invented Spelling subtest of the half-ERSI did not correlate with the Spelling subtest of the WRAT-R. Even though both of these subtests measure the ability to spell real words, it may be that the Invented Spelling subtest of the half-ERSI is somewhat more difficult than the Spelling subtest of the WRAT-R. Scores for the Invented Spelling subtest are derived from points awarded for the spelling of unfamiliar words with irregular spellings, whereas scores for the Spelling subtest of the WRAT-R are derived from points awarded for writing a child's own name, copying marks and spelling words, some of which may be familiar to the child. The increased difficulty associated with the half-ERSI Invented Spelling subtest may be why this measure correlated more strongly than the WRAT-R Spelling subtest with the other measures given. The half-ERSI Invented Spelling subtest significantly correlated with the Word Identification and Passage Comprehension subtests of the WRMT-R, the RAN Objects subtest and all four of the phonological awareness tasks,

whereas the Spelling subtest of the WRAT-R only correlated with the RAN Objects subtest and the Word Recognition subtest of the half-ERSI.

Independent variables, such as Sound Matching and Invented Spelling, were not accounted for in the regression model even though their moderate correlations with reading and spelling were significant. This is probably due to the fact that these variables were subject to range restrictions (i.e., scores skewed towards one end of the distribution) or lack of variation (i.e., lack of representation of scores across the whole range). Variation in scores is a contributing factor for an independent variable to be included in a regression model. The regression analyses did indicate that the Word Recognition subtest of the half-ERSI accounted for most of the variance in the reading and spelling scores, indicating that word recognition skills in kindergarten had the strongest association with first grade reading and spelling abilities than the phonological awareness tasks and the other pre-reading skills assessed in kindergarten.

The results of this study indicate the value of the half-ERSI as a screening measure to identify kindergarten children who do not possess the skills necessary to successfully learn to read. The half-ERSI assesses not only phonemic awareness, but also other pre-reading skills that are proven to have predictive validity in identifying children at-risk for reading failure. The half-ERSI provides a profile of a child's strengths and weaknesses on a variety of preceding skills. Whereas norms for the half-ERSI are included in this paper and in Lombardino et al. (in press), Lombardino and colleagues suggest that school districts develop their own local norms using 1.5 standard deviations below the mean as a cut-off for at-risk performance.

CLINICAL IMPLICATIONS

The importance of identifying children before they experience failure in learning to read cannot be stressed enough. Phonological awareness is critical to learning to break the alphabetic code. Children who do not understand the alphabetic principles of English demonstrate poor word recognition skills and spelling. The literature indicate a reciprocal relationship between phonological awareness and reading and spelling (Bowey & Francis, 1991; Goswami & Bryant, 1990; Swank, 1991). Early forms

of phonological awareness are necessary for the acquisition of reading. However, phonemic awareness develops with reading practice. When children are unsuccessful in their attempts to read, they lose interest in reading. This results in less practice and less opportunity to develop phonemic awareness and automatic word recognition skills which, in turn, puts comprehension at risk. In order to avoid this negative chain of events, early identification is critical.

Once a child is identified as having deficient phonological awareness skills, training should be implemented immediately. Training in phonological awareness and other pre-reading skills has consistently resulted in increased reading readiness and improved reading abilities (Ball & Blachman, 1988, 1991; Bradley & Bryant, 1985; Brady, Fowler, Stone & Winbury, 1994; Foorman, Francis, Novy & Liberman, 1991; Hohn & Ehri, 1993; Juel, Griffith & Gough, 1986; Tangel & Blachman, 1992; Torgesen, Morgan & Davis, 1992; Vellutino & Scanlon, 1986). Children who receive early training in phonological awareness have superior reading and spelling abilities

when compared to children who do not receive training (Bradley & Bryant, 1985; Lundberg, Frost & Peterson, 1988). Timing of treatment is key to success in learning to read. Adams (1990) maintains that if children who are not reading at grade level are brought up to grade level in the first few years of school, they will maintain grade level reading; however, if these children are not brought up to grade level during this time, it is not likely that they will ever catch up.

Phonological awareness training should also be used in all kindergarten classrooms as a preventive measure. Kindergarten teachers can ensure that all children gain the understanding that spoken language can be segmented through various classroom activities. Exposure to the phonological aspects of language and the alphabetic principles can be accomplished through games and activities that are fun for children. Examples of activities include reciting nursery rhymes, doing finger plays and clapping hands to words within a sentence and syllables within a word. More advanced activities to enhance phonemic awareness include rhyming games

and segmenting phonemes within words. These kinds of activities encourage children to form connections between speech and print. While for some children, exposure to print is enough to trigger these connections, for many other children it is not enough. Classroom instruction in phonological awareness not only benefits those children who have not made the connection between speech and print, but all children, regardless of their level of phonological awareness. Blachman, Ball, Black and Tangel (1994) found that at the end of kindergarten, the children who received phonological awareness instruction as part of their regular curriculum were better on a variety of phonological awareness, early reading and invented spelling tasks than children who did not receive instruction. In addition, this reading and spelling superiority was maintained throughout the third grade.

ACKNOWLEDGMENT

The authors wish to express their appreciation to Sana M'hod, Mary Gorham, Michelle Gorman, Karen Halliman and Eileen Greenbaum for their assistance in data collection.

REFERENCES

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.
- Alexander, A., Anderson, H., Heilman, P. C., Voeller, K. S. & Torgesen, J. K. (1991). Phonological awareness training and remediation of analytic decoding deficits in a group of severe dyslexics. *Annals of Dyslexia*, 41, 193-206.
- Ball, E. W. & Blachman, B. A. (1988). Phoneme segmentation training: Effects of reading readiness. *Annals of Dyslexia*, 38, 208-225.
- Ball, E. W. & Blachman, B. A. (1991). Does phoneme awareness training in kindergarten make a difference on early word recognition and spelling? *Reading Research Quarterly*, 26, (1), 49-66.
- Blachman, B. A. (1984a). Language analysis skills and early reading acquisition. In G. P. Wallace & K. G. Butler (Eds.) *Language Learning Disabilities in School Age Children* (pp. 271-287). Baltimore, MD: Williams & Wilkins.
- Blachman, B. A. (1984b). Relationship of rapid naming ability and language analysis skills to kindergarten and first grade reading achievement. *Journal of Educational Psychology*, 76, 610-622.
- Blachman, B. A. (1991). Early intervention for children's reading problems: Clinical application of the research in phonological awareness. *Topics in Language Disorders*, 12, (1), 51-65.
- Blachman, B. (1994). Early literacy acquisition. In G. P. Wallace & K. G. Butler (Eds.) *Language learning disabilities in school-age children and adolescents: Some principles and applications*. New York, NY: Merrill Publishing.
- Blachman, B. A., Ball, E. W., Black, R. S. & Tangel, D. M. (1994). Kindergarten teachers develop phoneme awareness in low-income, inner-city classrooms: Does it make a difference. *Reading and Writing: An Interdisciplinary Journal*, 6, (1), 1-18.
- Bowers, P. G., Steffy, R. & Tate, E. (1988). Comparison of the effects of IQ control methods on memory and naming speed predictors of reading disability. *Reading Research Quarterly*, 23, 304-319.
- Bowers, P. & Wolf, M. (1993). Theoretical links among naming speed, precise timing mechanisms and orthographic skill in dyslexia. *Reading and Writing: An Interdisciplinary Journal*, 5, (1), 69-85.
- Bowey, J. A. & Francis, J. (1991). Phonological analysis as a function of age and exposure to reading instruction. *Applied Psycholinguistics*, 12, 91-121.
- Bradley, L. & Bryant, P. E. (1978). Difficulties in auditory organization as a possible cause of reading backwardness. *Nature*, 221, 746-747.
- Bradley, L. & Bryant, P. (1985). *Rhyme and reason in reading and spelling*. Ann Arbor, MI: University of Michigan Press.
- Brady, S., Fowler, A., Stone, B. & Winbury, N. (1994). Training phonological awareness: A study with inner-city kindergarten children. *Annals of Dyslexia*, XLIV, 26-59.
- Catts, H. (1991). Facilitating phonological awareness: Role of speech-language pathologists. *Language Speech and Hearing Services in the Schools*, 22, 196-203.
- Clarke, L. (1988). Invented versus traditional spelling in first graders' writings: Effects on learning to spell and read. *Research in the Teaching of English*, 22, 281-309.
- Denckla, M. B. & Rudel, R. (1976a). Naming of objects-drawings by dyslexic and other learning disabled children. *Brain and Language*, 3, 1-15.
- Denckla, M. B. & Rudel, R. (1976b). Rapid automatized naming (RAN): Dyslexia differentiated from other learning disabilities. *Neuropsychologia*, 14, 471-479.
- Denckla, M. B., Rudel, R. & Broman, M. (1981). Tests that discriminate between dyslexic and other learning disabled boys. *Brain and Language*, 13, 118-129.
- Ehri, L. C. (1987). Learning to read and spell words. *Journal of Reading Behavior*, 19, 5-31.
- Ehri, L. C. (1989). The development of spelling knowledge and its role in reading acquisition and reading disability. *Journal of Learning Disabilities*, 22, (6), 356-364.
- Ehri, L. C. & Wilce, L. S. (1985). Movement into reading: Is the first stage of printed word learning visual or phonetic? *Reading Research Quarterly*, 20, 163-179.
- Foorman, B. R., Francis, D. J., Novy, P. M. & Liberman, P. (1991). How letter-sound instruction mediates progress in first grade reading and spelling. *Journal of Educational Psychology*, 83, (4), 456-469.
- Goswami, U. & Bryant, P. (1990). *Phonological skills and learning to read*. East Sussex, Great Britain: Lawrence Erlbaum Associates.
- Goswami, U. & Bryant, P. (1992). Rhyme, analogy and children's reading. In P. B. Gough, L. C. Ehri & R. Treiman (Eds.) *Reading acquisition* (pp. 49-63). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Gough, P. & Tunmer, W. (1986). Decoding, reading and reading disability. *Remedial and Special Education*, 7, (1), 6-10.

- Helfgott, J. A.** (1976). Phonological segmentation and blending skills of kindergarten children: Implication for beginning reading acquisition. *Contemporary Educational Psychology, 1*, 157-169.
- Hohn, W. E. & Ehri, L. C.** (1993). Do alphabet letters help prereaders acquire phonological segmentation skills? *Journal of Educational Psychology, 72*, 686-700.
- Jastak, S. & Wilkinson, G. S.** (1984). *Wide Range Achievement Test - Revised Level I*. Wilmington, DE: Jastak Associates.
- Juel, C., Griffith, P. & Gough, P.** (1986). Acquisition of literacy: A longitudinal study of children in first and second grade. *Journal of Educational Psychology, 18*, (4), 243-255.
- Krug, C.** (1995, November). *The diagnostic implications of the double-deficit hypothesis: An investigation of fifth grade readers classified by phonological awareness and visual naming speed*. Paper presented at the meeting of the American Speech-Language-Hearing Association, Orlando, FL.
- Lewkowicz, N. K.** (1980). Phonemic awareness training: What to teach and how to teach it. *Journal of Educational Psychology, 72*, 686-700.
- Lombardino, L. J., Morris, D., Gauger, L. M., DeFillipo, F., Sarisky, C. & Montgomery, A.** (in press). The Early Reading Scoring Instrument. A method for identifying kindergartners at-risk for learning to read. *International Journal of Language and Communication Disorders*
- Lombardino, L. J., Riccio, D., Hynd, G. & Pinheiro, S. B.** (1997). Linguistic deficits in children with reading disabilities. *American Journal of Speech-Language Pathology, 6*, (3), 71-78.
- Lundberg, L., Frost, J. & Peterson, O.** (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly, 23*, 263-284.
- Lundberg, L., Olofsson, A. & Wall, S.** (1980). Reading and spelling skills in the first few years predicted by phonological awareness in kindergarten. *Scandinavian Journal of Psychology, 21*, 159-173.
- Magnusson, E. & Naucler, K.** (1990). Reading and spelling in language-disordered children - linguistic and metalinguistic prerequisites: Report on a longitudinal study. *Clinical Linguistics and Phonetics, 4*, 49-61.
- Mann, V. A., Tobin, P. & Wilson, R.** (1987). Measures of phonological awareness through the invented spelling of kindergarten children. *Merrill-Palmer Quarterly, 33*, (3), 365-391.
- Mason, J. & Allen, J.** (1986). A review of emergent literacy with implications for research and practice in reading. In E. Z. Rothkopf (Ed.) *Review of research in education* (Vol. 13, pp. 3-47). Washington, D.C.: American Educational Research Association.
- Mason, J., Kerr, B., Sinha, S. & McCormick, C.** (1990). Shared book reading in an early start program for at-risk children. In J. Zutell, S. McCormick, M. Conolly & P. O'Keefe (Eds.) *Literacy theory and research: Analysis for multiple paradigms*. Thirty-ninth Yearbook of the National Reading Conference (pp. 189-198). Chicago, IL: National Reading.
- Masonheimer, P. E., Drake, P. A. & Ehri, L. C.** (1984). Does environment print identification lead children into word reading? *Journal of Reading Behavior, 16*, 257-272.
- Morais, J.** (1991). Constraints in the development of phonemic awareness. In S. A. Brady & D. P. Shankweiler (Eds.) *Phonological processing in literacy* (pp. 5-27). New York, NY: Lawrence Erlbaum Associates.
- Morris, D.** (1992). What constitutes at-risk: Screening children for first grade reading intervention. In W. A. Secord & J. S. Damico (Eds.) *Best practices in school speech language pathology* (pp. 43-51). Orlando, FL: Harcourt, Brace & Janovich, Inc.
- Morris, D. & Henderson, E. H.** (1981). Assessing the beginning reader's concept of word. *Reading World, 20*, 279-285.
- Morris, D. & Perney, J.** (1984). Development spelling as a predictor of first grade reading achievement. *Elementary School Journal, 84*, (4), 441-457.
- Read, C.** (1971). Preschool children's knowledge of English phonology. *Harvard Educational Review, 41*, 1-34.
- Share, P. L., Jorm, A. F., MacLean, R. & Matthews, R.** (1984). Sources of individual differences in reading acquisition. *Journal of Educational Psychology, 76*, 1309-1324.
- Stanovich, K. E., Cunningham, A. E. & Cramer, B. B.** (1984). Assessing phonological awareness in kindergarten children: Issues of task comparability. *Journal of Experimental Child Psychology, 38*, 175-190.
- Sulzby, E.** (1985). Children's emergent reading of favorite storybooks: A developmental study. *Reading Research Quarterly, 20*, 458-481.
- Swank, L. K.** (1991). Phonological awareness: A two-level hypothesis. (working papers in Language Development, Vol. 6, No. 2). Lawrence, KS: University of Kansas Child Development Program.
- Tangel, P. & Blachman, B. A.** (1992). Effect of phoneme awareness training instruction on kindergarten children's invented spelling. *Journal of Reading Behavior, 24*, (2), 233-256.
- Torgesen, J. K. & Wagner, R.** (1994). *Comprehensive Tests of Phonological Processing - Experimental Version*. Unpublished test, Florida State University.
- Torgesen, J. K., Morgan, S. T. & Davis, C.** (1992). Effects of two types of phonological awareness training on word learning in kindergarten children. *Journal of Educational Psychology, 84*, (3), 364-370.
- Torgesen, J. K., Wagner, R. K. & Rashotte, C. A.** (1994). Longitudinal studies of phonological processing and reading. *Journal of Reading Disorders, 27*, (5), 276-286.
- Tunmer, W. E. & Hoover, W. A.** (1992). Cognitive and linguistic factors in learning to read. In P. B. Gough, L. C. Ehri & R. Treiman (Eds.) *Reading acquisition* (pp. 175-214). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Tunmer, W. E. & Rohl, M.** (1991). Phonological awareness and reading acquisition. In D. J. Sawyer & B. J. Fox (Eds.) *Phonological awareness in reading: The evolution of current perspectives* (pp. 1-30). New York, NY: Springer-Verlag.
- Vellutino, F. R. & Scanlon, D. M.** (1986). Experimental evidence for the effects of instructional bias on word identification. *Exceptional Children, 53*, (2), 145-155.
- Wagner, R. K. & Torgesen, J. K.** (1987). The nature of phonological processing and its casual role in the acquisition of reading skills. *Psychological Bulletin, 101*, 192-212.
- Wolf, M.** (1984). Naming, reading and the dyslexias: A longitudinal overview. *Annals of Dyslexia, 34*, 87-115.
- Wolf, M.** (1991). Naming speed and reading: The contribution of the cognitive neurosciences. *Reading Research Quarterly, 26*, 123-141.
- Wolf, M., Bally, H. & Morris, H.** (1986). Automaticity, retrieval processes and reading: A longitudinal study of average and impaired readers. *Child Development, 57*, 988-1000.
- Wolf, M. & Goodglass, H.** (1986). Dyslexia, dysnomia and lexical retrieval: A longitudinal investigation. *Brain and Language, 28*, 154-168.
- Woodcock, R. W.** (1987). *Woodcock Reading Mastery Tests - Revised*. Circle Pines, MN: American Guidance Service, Inc.

Contact Author:

Laurie M. Gauger, Ph.D.
 Department of Diagnostic Radiology
 Klinikum Grosshadern
 Marchioninister, 15, 81377
 Munich, Germany
 e-mail: 100423.3364@compuserve.com

BEST COPY AVAILABLE

Infant-Toddler Communication Inventory

Linda J. Lombardino
University of Florida
Gainesville, FL
Kelli Murphy Vaudreuil
Monroe Regional Hospital
Ocala, FL

This paper is designed to provide speech-language pathologists and their assistants with a screening tool, the Infant-Toddler Communication Inventory, for use in identifying young children at-risk for developmental language disorders. A developmental list of behaviors that are easily identified in the domains of gestures, speech, language, and play and that have corresponding age ranges are provided to use as indices of children's developmental progress across communication domains. Behaviors in the scale have been documented in numerous developmental studies of communication acquisition in children through three years of age.

Language disorders are the most frequent developmental problems present in the period from birth to five years of age (Paul, 1995). According to Rosetti (1986) 5% to 15% of newborns can be considered at-risk for developing a language disorder and research has shown that children with early language problems are at a greater risk for later academic difficulties, particularly in areas of reading and spelling (Aram & Nation, 1980; Loban, 1976; Wells, 1981, 1985). Aram and Nation (1980) found that 40 percent of children with a diagnosis of language delay in the preschool years were later placed in special education classrooms. Thus, many language-delayed preschoolers do not outgrow their problems, but continue to have language-related academic difficulties well into school years.

Early intervention has been found to improve the intellectual and academic performance of children who are at-risk for developmental language delay (Ramey & Ramey, 1994). In a study that evaluated high-risk infants who had participated in an early intervention program compared to high-risk infants who had not received intervention, Ramey and Smith (1976) found that early educational intervention resulted in measurable intellectual differences both in standardized testing and in unstructured learning tasks. In an effort to find out more about the plasticity of intellectual development, Ramey, Yeats, and Short (1984) randomly assigned high-risk children at birth to one of two conditions. One group received only nutritional supplements and health care; the other group received nutritional and health care along with direct educational experience through a daycare program designed to foster intellectual development with emphasis on language development. The experimental group began attending the daycare program at three months of age and the two groups were studied through four years of age. Subjects were re-tested every six months beginning at six months of age. Significant IQ differences were found between the experimental and control groups after the age of 18 months; the difference between the two groups became larger as development continued. These findings suggest that developmental functions are moderately alterable through early preventive intervention (Ramey et al., 1984).

Recently Ramey and Ramey (1994) reviewed the long-term effects of three early intervention projects: the Abecedarian

Project; Project CARE; and the Infant Health and Development Program (IHD). All three programs provided medical and nutritional care along with intensive, language-enriched intervention in a daycare setting. The programs began shortly after birth and continued at least until the children entered kindergarten. At three years of age, the intervention groups (data from the three program combined) showed an average IQ score of 13 points higher than the average score for the control groups. Ramey and Ramey (1994) followed all of the children from the Abecedarian Project through 12 years of age, when they were re-evaluated for reading, math, and overall IQ. Results showed that all of the early intervention group mean scores for the three tests were above the control group mean scores, supporting the tenet that early intervention can produce long-lasting benefits in intellectual performance. The study also found early intervention to be associated with an almost 50% reduction in the rate of failing a grade during elementary school (Ramey & Ramey, 1994). These data add further support to the widespread impact that language deficits have on later academic success and underscore that children who enter school with a higher level of language skills will be at an advantage (Roberts, Rabinowitch, Bryant, Burchinal, Koch & Ramey, 1989).

All of these findings suggest that a relatively small investment in early intervention can have important long-term effects. A major issue, then, is how to identify those children who may be at-risk for developing a language disorder. Early assessment refers to the assessment of children from birth to three years of age by examining the acquisition of communicative behaviors from the prelinguistic period through the emergence of syntax. Numerous standardized as well as non-standardized assessment tools are currently available for this purpose.

Standardized tools that are frequently used to assess infant and toddler behavior include: *The Birth to Three Checklist of Learning and Language Behavior* (Bangs, 1986), the *Communication and Symbolic Behavior Scales* (Wetherby & Prizant, 1993), the *MacArthur Communicative Development Inventory* (Fenson et al., 1993), the *Preschool Language Scale-3* (Zimmerman, Steiner & Pond, 1992), the *Bzoch-League Receptive-Expressive Emergent Language Scale* (Bzoch & League, 1991) and the *Rosetti Infant-Toddler*

Communication Scale (Rosetti, 1990).

The *Infant-Toddler Communication Inventory* (ITCI) was designed to be used as a first step in the process to identify the developmental status of children's gestural, speech, language, and play behaviors. Because the behaviors across four domains of communication have been arranged in a hierarchy, the ITCI yields information regarding not only the developmental stage at which a child is functioning, but identifies subsequent stages of development. The ITCI is meant only to be used for screening purposes, and does not in itself constitute a thorough language evaluation. Following the administration of further formal testing, this tool can be used as a guideline for therapy goals to facilitate growth through one or more communication domains.

The ITCI should provide the clinician with a comprehensive screening of a child's current level of functioning. Rather than requiring the child to perform a specific action at the time of testing, the ITCI looks simply for levels of development. For example, instead of having a child name a certain number of pictures in a book during the evaluation in order to "pass" that item, the ITCI asks "Does he/she name pictures/label items?" An example of this behavior can either be observed or elicited during play or can be reported by the parent.

ITCI Content

The ITCI is a criterion-referenced instrument. The specific ages and skills used in the ITCI were taken from various developmental studies. When possible a class of behaviors representing a specific level of development was used rather than specific actions. The clinician can use this tool and other assessment documentation to determine a) if the current developmental level is age appropriate, and b) where to begin intervention in order to facilitate the child's growth into the next developmental stage. Following is a list of the developmental studies used for each section, along with the rationale for each study used.

Prelinguistic Behaviors. Prelinguistic behaviors are organized into three developmental levels based on Sugarman's (Sugarman, 1983) system for examining children's developmental scheme complexity during the first eight months of life and Bates' et al (1975) scheme for examining the development of intentional/conventional gestures. Non-coordinated prelinguistic behaviors are actions performed by an infant which have a communicative effect on

the listener, but are unintentional on the part of the child. These schemes can be hierarchically categorized as simple versus complex, and object-oriented versus social (or people-oriented). A "simple" scheme is one that involves only one action (i.e., pushing), while a "complex" scheme involves two or more related actions (i.e., pushing one object away in order to grab another). The child eventually begins to combine these schemes so that he/she is able to readily coordinate an object-oriented scheme (i.e., batting a toy) with a social scheme (i.e., smiling at an adult). At this stage, the child is exhibiting coordinated prelinguistic behaviors, such as purposefully gaining an adult's attention then reaching to show what he/she wants (Bates et al., 1975). Behaviors like these are considered immediate precursors to verbal language. Children do not, however, move directly from the use of non-coordinated schemes to coordinated behaviors. They pass through a transitional period during which their actions become increasingly intentional, but do not yet combine object-social schemes (Lombardino et al., 1987). An example of each behavior type is listed in Appendix B.

Expressive Language. The expressive language developmental milestones, like all sections of the ITCI, are arranged in hierarchical order, beginning with protowords (consistently used sound combinations to convey a meaning or intention) and moving through increasingly complex semantic-syntactic functions of verbal language. Brown (1973) described the semantic forms typically seen in children's early utterances. According to Brown (1973) the common pattern observed in the acquisition of word functions among toddlers worldwide exists because at the age when first words are emerging, most toddlers are becoming less focused on themselves and more aware of relationships among people, objects, and events. This new awareness, along with concepts which were learned in the preceding stage of sensorimotor development, allow the child to think about the things he observes in new ways. In other words, when a child looks at a person or object, he can now think in terms of its name, where it is, its action, its attributes, who it belongs to, etc. His verbalizations of these concepts can be evaluated in terms of their semantic function. Based on a child's age and mean length of utterance (MLU), there are certain semantic relations that should be reflected in his/her language (Brown, 1973).

Using Brown's scheme, Miller (1981) categorized children's use of wh-questions by the age and approximate MLU at which each is expected to emerge. The development of the appropriate use of question forms, like the semantic functions described by Brown, is related to (and dependent upon) the acquisition of concepts. A child must comprehend the concept of causation in order to ask (or answer) "why" questions. Therefore, later developing forms of questions can be traced to later development of the concepts they employ (Miller, 1981).

Receptive Language. The receptive language portion of the ITCI comprises behaviors from several assessment tools. These include the *Birth to Three Checklist of Learning and Language Behavior* (Bangs, 1986) and the *Rosetti Infant-Toddler Communication Scale* (Rosetti, 1990). Since both of these require the child to follow specific commands, a general description is assigned to the types of command used, i.e., "Sit down" is described as a "simple one-step command." Each receptive language command was placed within the most appropriate developmental level and assigned an approximate age equivalent.

Pragmatics. The pragmatic behaviors used in the ITCI were adapted from Roth and Spekman's (1984) developmental scale of communicative intentions. Pragmatic functions are arranged into three categories: preverbal, single-word, and multi-word. Nelson (1993) stressed the importance of pragmatic development in infants and toddlers, stating that the appropriate use of language is necessary not only so that the child can control his/her environment, but so that language serves as a powerful reinforcer for the further development of all other aspects of language. When a child discovers that his/her wants and needs are met through language, this provides the child with the motivation to continue and expand his/her communication skills.

Phonology. Phonological milestones used in for the ITCI are a summary of Bleile's (1995) description of sound acquisition from both through three years. Bleile's milestones for the emergence of phonology reflect the sequence of sound acquisition outlined by Ingram's (1976) description of phonological development as it relates to Piaget's stages of cognitive development. According to Ingram (1976), in the period from birth to twelve months of age communication is accomplished primarily through crying and gestures, but certain pre-

requisites for speech are developing. As children progress through Piaget's sensorimotor stage of development, organized groups of sounds begin to appear, which allow for the emergence of first words around twelve months of age. Ingram (1976) notes that children acquire most of the sounds of their language and learn to combine them beginning about eighteen months of age and continuing until age four. Initially, a child may employ various phonological processes in an attempt to simplify language, but in normal development these processes are gradually eliminated and all classes of sounds are used. Kent (1992) presents a organizational scheme to illustrate the parallels in development of speech perception, production, and general communication development during the first 12 months of life.

Play. The play assessment portion of the ITCI is a modification of the *Symbolic Play Assessment Scale* (Lombardino & Kim, 1993). This scale is an observational tool for assessing the development of symbolic play in children age 9 months to five years. Approximate ages correspond to each level of play assessed. Research has shown that play develops in conjunction with language, and that cognitive skills reflected in the play of infants and toddlers are also reflected in their use of language at any given point in development. For example, the emergence of symbolic play around fourteen months of age coincides with a rapid increase in the use of single words. Both symbolic play and the use of words require that the child be cognitively able to comprehend and use symbols. This transition into "symbolic" behavior does not occur until the child moves through the sensorimotor stage of development and makes the transition to representational thought, around 16-24 months of age. Wesby (1988) notes that the primary advantage of assessing a child's play skills is that it provides an avenue to examine and gain information about symbolic functioning with and without language.

ITCI Procedures

The ITCI is intended for use with chil-

dren whose developmental level falls within the range of birth to three years of age. Therefore, it can be used to assess a child whose chronological age is more than three years of age who has a known or suspected language delay. An example of each behavior on the ITCI can be found in Appendix B.

Prior to beginning the evaluation, the examiner should make certain that varied and age-appropriate toys are available to the child. A short list of objects needed to complete all sections of the ITCI are listed here. Additional toys may be used as well.

Objects needed for administration:

- Several simple objects, i.e. doll, ball, car
- Objects that can be used together in a scheme, i.e. bowls, spoons, pots, bottles for a cooking scheme; stethoscope and other play items for a "doctor" scheme
- Doll, shoe, car, spoon, cup, pictures of a bed and a spoon/fork (These items are needed for specific segments of the receptive portion of scale.)

At the beginning of the screening session, the child should be encouraged to play freely for approximately ten minutes. This will allow him/her to become more comfortable both with the examiner and with the testing environment, if it is new to the child. This also gives the examiner time to observe the child. As specific behaviors are observed, they should be marked on the screening form by writing a positive sign (+) in the "Observed" column corresponding to each particular behavior.

After the initial ten minute warm-up period, the examiner should attempt to elicit any behaviors not directly observed. This includes those behaviors reported by the parent to occur. Behaviors that are successfully elicited should be marked (+) in the "Observed" column. (The examiner may want to differentiate those behaviors occurring spontaneously and those that were elicited. This can be done by writing an "E" next to all elicited behaviors.) Any behaviors reported by the parent that are not able

to be elicited should be scored with a (+) in the "Reported" column and should be considered "positive" for scoring purposes. The minimum level of performance required for mastery of each age level is established when three consecutive behaviors are observed by the examiner or reported by the child's caregiver. Once all spontaneous behaviors have been noted, the examiner should attempt to elicit behaviors beyond the developmental level of the highest behavior observed to occur spontaneously. Any behaviors that are not observed spontaneously, elicited, or reported by the parent, should be scored with a negative sign (-) on the screening form in both the "Observed" column and the "Reported" column. When three of five consecutive items are scored (-) a maximum level has been reached and testing can be discontinued. A minimum and maximum level of performance should be established for each section. Specific examples of each behavior can be found in Appendix B.

After the highest item has been scored as (+) for each section, an approximate developmental age for each language area can be determined. The last behavior scored as (+) before the first of the three (-) scores represents the child's current developmental level. A corresponding developmental age range is given for each level. The developmental age level for each section should be transferred to the Scoring Summary section.

If a child's performance on the screening is satisfactory, a comprehensive speech/language evaluation does not need to be completed. If scores in any one area of language are delayed more than six months or if scores in any three areas are delayed more than three months, a full speech/language evaluation is warranted. This can be accomplished with standardized or non-standardized assessment tools that will provide a more complete picture of the child's abilities. Information from these procedures, along with the information gathered during the administration of this screening tool, can be used to set appropriate treatment goals.

REFERENCES

- Aram, D. M. & Nation, J. E. (1980). Preschool language disorders and subsequent language and academic difficulties. *Journal of Communication Disorders, 13*, 159-170.
- Bangs, T. E. (1986). *Birth to three checklist of learning and language behavior*. Allen, TX: DLM Teaching Resources.
- Bates, E., Camaioni, L. & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly, 21*, 205-226.
- Bleile, K. M. (1995). *Manual of articulation and phonological disorders: Infancy through adulthood*. San Diego, CA: Singular Publishing Group, Inc.
- Brown, R. (1973). *A first language: The early stages*. Cambridge, MA: Harvard University Press.
- Bzoch, K. R. & League, R. (1991). *Receptive-expressive emergent language scale*. Gainesville, FL: The Tree of Life Press.
- Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., Pethick, S. & Reilly, J. S. (1993). *MacArthur communicative development inventories*. San Diego, CA: Singular Publishing Group.
- Ingram, D. (1976). *Phonological disability in children*. New York, NY: American Elsevier.
- Kent, R. (1992). Phonological development as biology and behavior. In R. S. Chapman (Ed.) *Processes in language acquisition and disorders*. St. Louis, MO: Mosby-Year Book.
- Lohan, W. (1976). *Language development: Kindergarten through grade twelve*. Champaign-Urbana, IL: National Council of Teachers of English.
- Lombardino, L. J. & Kim, Y. (1993). Symbolic play assessment scale. Unpublished manuscript.
- Lombardino, L. J., Stapell, J. B. & Gerhardt, K. J. (1987). Evaluating communicative behaviors in infancy. *Journal of Pediatric Health Care, 1*, 240-246.
- Miller, J. F. (1981). *Assessing language production in children*. Baltimore, MD: University Park Press.
- Nelson, N. W. (1993). *Childhood language disorders in context: Infancy through adolescence*. New York, NY: Macmillan Publishing Company.
- Paul, R. (1995). *Language disorders from infancy through adolescence: Assessment and intervention*. St. Louis, MO: Mosby-Year Book.
- Ramey, C. T. & Ramey, S. L. (1994). Which children benefit the most from early intervention? *Pediatrics, 94*, 1064-1066.
- Ramey, C. T. & Smith, B. J. (1976). Assessing the intellectual consequences of early intervention with high-risk infants. *American Journal of Mental Deficiency, 81*(4), 318-324.
- Ramey, C. T., Yeates, K. O. & Short, E. J. (1984). The plasticity of intellectual development: Insights from preventive intervention. *Child Development, 55*, 1913-1925.
- Roberts, J. E., Rabinowitch, S., Bryant, D. M., Burchinal, M. R., Koch, M. A. & Ramey, C. T. (1989). Language skills of children with different preschool experiences. *Journal of Speech and Hearing Research, 32*, 773-786.
- Rosetti, L. (1986). *High risk infants: Identification, assessment and intervention*. Boston, MA: College-Hill Press.
- Rosetti, L. (1990). *Rosetti infant-toddler language scale*. East Moline, IL: LinguiSystems.
- Roth, F. & Spekman, N. (1984). Assessing the pragmatic abilities of children. Part I: Organizational framework and assessment parameters. *Journal of Speech and Hearing Disorders, 49*, 4.
- Sugarman, S. (1983). *Children's early thought: Developments in classification*. New York, NY: Cambridge University Press.
- Wells, G. (1981). *Learning through interaction: The study of language development*. Cambridge, MA: Cambridge University Press.
- Wells, G. (1985). *The meaning makers: Children learning language and using language to learn*. Portsmouth, NH: Heinemann.
- Westby, C. E. (1988). Children's play: Reflections of social competence. *Seminars in speech and language, 9*, 1-13.
- Wetherby, A. M. & Prizant, B. (1993). *Communication and symbolic behavior scales*. San Antonio, TX: Special Press.
- Zimmerman, I. L., Steiner, V. G. & Pond, R. E. (1992). *Preschool language scale*. Orlando, FL: The Psychological Corporation.

Contact Author:

Linda J. Lombardino, Ph.D.
 Department of Communication Sciences and Disorders
 464 Dauer Hall
 University of Florida
 Gainesville, FL 32611
 e-mail llombard@csd.ufl.edu

BEST COPY AVAILABLE

APPENDIX A

THE Infant-Toddler Communication Inventory INSTRUMENT

Name:

Date of Birth:

Date:

Chronological Age:

PRELINGUISTIC BEHAVIORS			
NON-COORDINATED BEHAVIORS (1-8 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Simple object schemes (1-6 mo.)			
Simple social schemes (1-6 mo.)			
Complex object schemes (6-8 mo.)			
Complex social schemes (6-8 mo.)			
TRANSITIONAL BEHAVIORS (8-11 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Reaching for objects			
Giving objects to gesture (outstretched hand)			
Showing off (to gain attention)			
COORDINATED BEHAVIORS (11-13 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Showing objects			
Giving objects spontaneously			
Communicative Point			

EXPRESSIVE LANGUAGE				
<i>Behaviors</i>		<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Protowords (8-13 mo.)	Vocalizes during play			
	Vocalizes with intent			
Semantic Functions (12-20 mo.)	agent			
	action			
	object			
	location			
	recurrence			
	negation			
	cessation			
	possession			
	routine "wh-" questions			
	agent + action			
Two-word Semantic-Syntactic Relations (20-30 mo.)	action + object			
	agent + object			
	negative + X			
	agent/object + location			
	action + location			
	pronoun use			
	present progressive -ing			
	use of <i>in</i>			
	use of <i>on</i>			
	regular plural -s			
	novel "wh-" questions			

EXPRESSIVE LANGUAGE				
Three-word Semantic-Syntactic Relations (30-36 mo.)	agent + action + object			
	action + object + location			
	irregular past			
	possessive -'s			
	auxiliary verbs "can," "will," & "do"			
	conjunctions "but," "so," "or," "if," & "and"			
	regular third person -s			
	use of "why" & "who"			

EXPRESSIVE LANGUAGE				
RECEPTIVE LANGUAGE				
Behaviors		Observed	Reported	Examples
0-6 months	Quiets to human voice			
	Localizes to sound			
6-12 months	Responds to "no"			
	Responds to own name			
	Looks for familiar person/object when named			
	<i>Responds consistently to:</i>			
12-16 months	Simple 1-step commands			
16-18 months	Commands to show objects			
	Short, simple questions			
18-24 months	Commands to give objects			
24-26 months	Complex 1-step commands			
26-30 months	2-step commands			
	Possessive pronouns			
30-36 months	Discriminates between "big" and "little."			
	Identifies pictures by use.			

PRAGMATIC LANGUAGE				
	<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Preverbal (0-12 mo.)	Attention seeking			
	Requesting			
	Greeting			
	Protesting/Rejecting			
	Responding			
Single-word (12-20 mo.)	Naming			
	Commenting			
	Requesting			
	Responding			
	Protesting/Rejecting			
	Attention seeking			
	Greeting			
Multi-word (20-36 mo.)	Requesting information			
	Requesting action			
	Stating/Commenting			
	Regulating conversation			
	Other (teasing, humor, etc.)			

PHONOLOGY				
Behaviors		Observed	Reported	Examples
0-1 month	Vegetative sounds			
2-3 months	Cooing			
3-4 months	Babbling behavior			
4-5 months	Squeals, growls, raspberries: sounds produced at front of mouth			
6-8 months	Reduplicated babbling (repetition of C and V syllables)			
9-12 months	Variegated babbling (repetition of a variety of C and V syllables)			
12-15 months	Stops and nasals predominate			
	Simple consonant-vowel sequences			
15-24 months	9-10 consonants in initial position			
	5-6 consonants in final position			
24-36 months	/p, l, j/ initial position			
	/m, n, s/ final position			
	voiced stops in final position			
	consonant clusters in initial and final position			

PLAY				
Behaviors		Observed	Reported	Examples
3-6 months	Undifferentiated actions on objects			
6-9 months	Expanded schemes for relating to objects in relational play			
9-12 months	Differentiated schemes			
12-14 months	Presymbolic schemes: Conventional use of objects			
14-16 months	Autosymbolic schemes: Pretend play, actions directed to self			
16-18 months	Single schemes: Pretend play, extending actions beyond self			
18-20 months	Single scheme combination: One pretend scheme with 2 or more recipients			
20-24 months	Two-scheme combination			
24-30 months	Object substitution play			
	Agent play			
30-36 months	Multi-scheme combinations			

Profile Summary		
Communication Domains	Approximate Developmental Age	Approximate Months Delayed
prelinguistic behaviors		
expressive behaviors		
receptive behaviors		
pragmatic language		
phonology		
play		

	Approximate Developmental Age	Approximate Months Delayed
Prelinguistic Behaviors	_____	_____
Expressive Language	_____	_____
Receptive Language	_____	_____
Pragmatic Language	_____	_____
Phonology	_____	_____
Play	_____	_____

APPENDIX B

THE Infant-Toddler Communication Inventory INSTRUMENT
Sample Form

Name:

Date of Birth:

Date:

Chronological Age:

PRELINGUISTIC BEHAVIORS			
NON-COORDINATED BEHAVIORS (1-8 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Simple object schemes (1-6 mo.)			<i>Watches mobile, bats toys</i>
Simple social schemes (1-6 mo.)			<i>Smiles at adult, coos at adult</i>
Complex object schemes (6-8 mo.)			<i>Drops one object to pick up another</i>
Complex social schemes (6-8 mo.)			<i>Bounces up & down to recreate game</i>
TRANSITIONAL BEHAVIORS (8-11 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Reaching for objects			
Giving objects to gesture (outstretched hand)			
Showing off (to gain attention)			
COORDINATED BEHAVIORS (11-13 months)			
<i>Behaviors</i>	<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
Showing objects			<i>Shows toy to adult, but will not give it</i>
Giving objects spontaneously			<i>Gives toy to adult without being asked</i>
Communicative Point			<i>Looks at adult, then points to what he/she wants</i>

EXPRESSIVE LANGUAGE				
Behaviors		Observed	Reported	Examples
Protowords (8-13 mo.)	Vocalizes during play			<i>Makes noises while playing, with or without adult present</i>
	Vocalizes with intent			<i>Makes noises to indicate wants/displeasure</i>
Semantic Functions (12-20 mo.)	agent			<i>"Mommie" "doggie"</i>
	action			<i>"want" "go"</i>
	object			<i>"ball" "juice"</i>
	location			<i>"out" "here"</i>
	recurrence			<i>"more"</i>
	negation			<i>"no" "don't"</i>
	cessation			<i>"stop"</i>
	possession			<i>"mine"</i>
	routine "wh-" questions			<i>"What that?"</i>
Two-word Semantic-Syntactic Relations (20-30 mo.)	agent + action			<i>"Mommie go"</i>
	action + object			<i>"Want juice"</i>
	agent + object			<i>"Mommie juice"</i>
	negative + X			<i>"Don't want" "No bite"</i>
	agent/object + location			<i>"Mommie out" "Ball car"</i>
	action + location			<i>"Throw here"</i>
	pronoun use			<i>I, you, him, her</i>
	present progressive -ing			<i>"going" "playing"</i>
	use of <i>in</i>			
	use of <i>on</i>			
	regular plural -s			<i>"shoes" "toys"</i>
	novel "wh-" questions			<i>"What you eat?" "Where you going?"</i>

EXPRESSIVE LANGUAGE				
Three-word Semantic-Syntactic Relations (30-36 mo.)	agent + action + object			"Baby want juice"
	action + object + location			"Want ball here"
	irregular past			"went"
	possessive -'s			"Mommie's" "doggie's"
	auxiliary verbs "can," "will," & "do"			"I can help"
	conjunctions "but," "so," "or," "if," & "and"			
	regular third person -s			"Daddy wants cookie"
	use of "why" & "who"			

RECEPTIVE LANGUAGE				
Behaviors		Observed	Reported	Examples
0-6 months	Quiets to human voice			Ceases crying in response to mother's voice
	Localizes to sound			Turns head toward mother voice
6-12 months	Responds to "no"			Stops activity after hearing "no"
	Responds to own name			Looks up when name was called
	Looks for familiar person/object when named			Looks up from play to find dog when dogs name is called
	<i>Responds consistently to:</i>			
12-16 months	Simple 1-step commands			<i>Sit down. Clap your hands.</i>
16-18 months	Commands to show objects			<i>Show me ____.</i>
	Short, simple questions			<i>Where is ____?</i>
18-24 months	Commands to give objects			<i>Give me ____.</i>
24-26 months	Complex 1-step commands			<i>Put baby in shoe. Give me shoe and baby.</i>
26-30 months	2-step commands			<i>Put baby in shoe and give me car.</i>
	Possessive pronouns			<i>"mine" "yours"</i>
30-36 months	Discriminates between "big" and "little."			<i>Picks up correct dog in response to a command to get the "big" doggie</i>
	Identifies pictures by use.			<i>"What do you eat with/sleep in?"</i>

PRAGMATIC LANGUAGE				
	Behaviors	Observed	Reported	Examples
Preverbal (0-12 mo.)	Attention seeking			<i>Tugs adult's hand for attention. Points to object to show adult.</i>
	Requesting			<i>Points to toy he/she wants. Hands book to adult to have it read.</i>
	Greeting			<i>Waves "hi" or "bye."</i>
	Protesting/Rejecting			<i>Cries when displeased. Pushes away unwanted food.</i>
	Responding			<i>Responds to simple directions.</i>
Single-word (12-20 mo.)	Naming			<i>"dog" "ball"</i>
	Commenting			<i>"big" "mine"</i>
	Requesting			<i>"want" "cookie" "more"</i>
	Responding			<i>Responds appropriately to questions.</i>
	Protesting/Rejecting			<i>"no" "yucky"</i>
	Attention seeking			<i>"Mommie" "watch"</i>
	Greeting			<i>"hi" "night-night"</i>
Multi-word (20-36 mo.)	Requesting information			<i>"Where's doggie?"</i>
	Requesting action			<i>"Give me cookie"</i>
	Stating/Commenting			<i>"I don't like dogs"</i>
	Regulating conversation			<i>"Know what I did?"</i>
	Other (teasing, humor, etc.)			<i>"Can't catch me" "Doggie said 'meow'"</i>

PHONOLOGY				
<i>Behaviors</i>		<i>Observed</i>	<i>Reported</i>	<i>Examples</i>
0-1 month	Vegetative sounds			<i>cough, sneeze</i>
2-3 months	Cooing			<i>single vowels "ooo" "aaa"</i>
3-4 months	Babbling behavior			<i>"b-b-b-b"</i>
4-5 months	Squeals, growls, raspberries: sounds produced at front of mouth			
6-8 months	Reduplicated babbling			<i>/bababa/ /gagaga/ (same consonant)</i>
9-12 months	Variegated babbling			<i>/babama/ (2 or more different consonants)</i>
12-15 months	Stops and nasals predominate			<i>/p,b,t,d,k,g,m,n/</i>
	Simple consonant-vowel sequences			<i>/mama/ /baba/ /dada/</i>
15-24 months	9-10 consonants in initial position			
	5-6 consonants in final position			
24-36 months	/p, l, j/ initial position			
	/m, n, s/ final position			
	voiced stops in final position			<i>/b,d,g/</i>
	consonant clusters in initial and final position			

PLAY				
Behaviors		Observed	Reported	Examples
3-6 months	Undifferentiated actions on objects			<i>Puts everything in mouth. Bangs everything.</i>
6-9 months	Expanded schemes for relating to objects in relational play			<i>Uses more actions, i.e. poking, shaking, turning.</i>
9-12 months	Differentiated schemes			<i>Shakes rattle. Pushes car.</i>
12-14 months	Presymbolic schemes: Conventional use of objects			<i>Touches phone to ear then drops it. Picks up broom, touches it to floor, then drops it.</i>
14-16 months	Autosymbolic schemes: Pretend play, actions directed to self			<i>"Drinks" from empty cup. Hugs doll.</i>
16-18 months	Single schemes: Pretend play, extending actions beyond self			<i>Feeds doll. Picks up toy cat and says "meow."</i>
18-20 months	Single scheme combination: One pretend scheme with 2 or more recipients			<i>Feeds doll then self.</i>
20-24 months	Two-scheme combination			<i>Scoops food from plate and feeds doll.</i>
24-30 months	Object substitution play			<i>Uses a block for a spoon. Puts imaginary doll to bed.</i>
	Agent play			<i>Pretends doll can talk by speaking for it.</i>
30-36 months	Multi-scheme combinations			<i>Scoops food from plate, feeds doll, then wipes doll's mouth.</i>

Understanding Exercise: A Tutorial

Edie R. Hapner
 Evelyn Trammell Voice
 & Swallowing Center of
 St. Joseph's Medical Center,
 Atlanta, GA
 Vanderbilt University, Nashville, TN

This tutorial will explain exercise at its most basic level. Many quality exercise texts will give the reader significantly more information than this article on the physiological basis of exercise, exercise prescription and exercise testing. These texts are referenced in the bibliography of this tutorial. The effects of exercise, the principles of exercise prescription and the components of an exercise program will all be presented in the initial pages of this paper. No attempt will be made to relate this information to speech and voice until the end of this paper. This is being done deliberately to encourage the reader to postulate on the application of exercise science to speech pathology, and the rationale for many exercises performed by speech pathologists to attempt to remediate or develop the skeletal muscle involved in speech and voice. But remember before you begin to read, you will not find the answers to your questions at the end of this paper. You will find more questions that will hopefully stimulate you to read more, question more and think more about the types of "exercises" you do with your patients and their purpose.

Speech pathologists use "exercises" to improve speech, voice and swallowing with a large majority of their caseloads. Often, the exercise task is supposed to improve the strength, flexibility, range of motion or speed of the muscle exercised. However, do speech pathologists really know what muscle(s) are being exercised? Do they know the difference between types of exercises and their effects on the muscles? Do they know how often to exercise, how intense to exercise or even how long to exercise?

This tutorial will explain exercise at its most basic level. Many quality exercise texts will give the reader significantly more information than this article on the physiological basis of exercise, exercise prescription and exercise testing. These texts are referenced in the bibliography of this tutorial. The effects of exercise, the principles of exercise prescription and the components of an exercise program will all be presented in the initial pages of this paper. No attempt will be made to relate this information to speech and voice until the end of this paper. This is being done deliberately to encourage the reader to postulate on the application of exercise science to speech pathology, and the rationale for many exercises performed by speech pathologists to attempt to remediate or develop the skeletal muscle involved in speech and voice. But remember before you begin to read, you will not find the answers to your questions at the end of this paper. You will find more questions that will hopefully stimulate you to read more, question more and think more about the types of "exercises" you do with your patients and their purpose.

What Happens in the Body During Exercise?

The origins of exercise date back to the early civilizations of Syria, China and Mesopotamia (McArdle, Katch & Katch, 1996). However, in 156 A.D. Galen emerged as the first physiologist and physician interested in exercise and health. Galen defined exercise as any movement that caused a change in respiration. If an activity caused a person to breath harder or faster, it was defined as exercise. To understand Galen's definition, one must understand the very basics of what occurs in the body with exercise.

The need to breath harder and faster during exercise is a result of the increased need for oxygen by the active muscles. When muscles begin to work above their

resting state, they need additional fuel to contract. The fuel for muscle work is called ATP (adenosine triphosphate). ATP can be manufactured from several sources, but the most efficient source for continuous ATP production is oxygen. The more ATP needed, the more oxygen is needed to produce the ATP.

Once oxygen enters the lungs, it enters the blood stream and is carried to the active muscles. The heart is the pump that forces the oxygen-rich blood to the muscles. The heart must pump at a faster rate or pump more blood per beat (increased stroke volume) to supply the needy muscles in a timely fashion. The end result is that with increased muscle work, heart rate and respiratory rate increase to supply the active muscles with the oxygen needed to produce ATP.

Changes in heart rate and respiratory rate during exercise are called adaptations. Adaptations of the body during exercise occur to provide ATP to the active muscles quickly and efficiently. The more intense the exercise the more significant the bodily adaptations. Interestingly, not only does the body adapt to acute bouts of exercise by increasing heart rate and respiration to produce ATP, but it also adapts to chronic exercise by becoming a more efficient ATP producer. The body adapts to produce ATP with a lower heart rate and lower respiratory rate as a consequence of consistent, intense exercise.

The muscles also adapt during exercise by recruiting more fibers to contract or by contracting at faster rate. The individual muscle fibers that make up the muscle adapt to consistent exercise by allowing the performance of increased workloads with less recruitment of muscle fibers or a lower rate of firing for the contraction. This adaptation results from metabolic changes within the muscle fiber itself. These changes allow the fiber to be a more efficient producer of ATP. When the muscle fiber is supplied with adequate amounts of ATP in a timely fashion, it is able to perform increased levels of work without the aid of other muscle fibers.

Different Exercises and Their Effects on the Body

Different types of exercise cause different adaptations of the body when used consistently. Endurance exercises and strength/speed exercises result in very different cardiac, respiratory and metabolic changes.

Endurance Exercises. Endurance exercises are those exercises that rely primarily on oxygen to produce ATP and are referred to as aerobic exercises. Exercises like distance running, swimming, distance walking and aerobic classes in the gym are all considered endurance activities because they rely on a steady production of ATP to fuel their performance. When done with regularity, endurance exercises cause a reduction in heart rate, blood pressure and metabolic rate.

Strength/Speed Exercises. Strength/speed exercises are those that rely on anaerobic, or non-oxygen driven, systems to produce ATP. Strength/speed exercises include sprinting, weight lifting, football and any activity that requires rapid, all out muscle work. Unlike the aerobic system that fuels long duration activities, the anaerobic system that fuels the strength/speed activities does not have a long life span. Strength/speed exercises rely on fuel that is stored in the muscle to quickly fuel the muscle work. Unfortunately, very little fuel is stored within the muscle and within 3 minutes, the muscle depletes its fuel source and requires oxygen to produce more fuel to continue its contractions. When the contractions are fueled by oxygen, the exercise then becomes aerobic.

However, it is important to remember that all muscle work is on a continuum. Few activities are purely aerobic or anaerobic. Imagine yourself running a nice, slow 15 minute mile. Your body is steadily producing ATP and you feel good. Suddenly, you realize that you are running uphill and you must give yourself an extra boost of energy to get up the hill at the same pace you were running on flat land. You push a bit harder and you are able to remain at a steady pace and make it up the hill. When you pushed harder, you used the stored fuel in the muscle and the activity took on a component of anaerobic exercise.

So, why does it matter what type of exercise you are doing or what system fuels your exercise? The answer is specificity of exercise. Specificity of exercise means that you get what you exercise. If you exercise by running, you will adapt your system to be a better runner. You won't be a better bike rider, you will be a better runner. Exercise training is specific and the need to be good in several exercise tasks requires cross-training (Skinner, 1993; Wojtys, Huston, Taylor & Bastian, 1996).

What is Exercise Training?

Exercise training is a specific, individualized program designed to produce desired adaptations of the body to meet a certain goal. If the goal is to reduce the risk of heart disease, a program designed to produce a higher level of aerobic fitness should be implemented. If the goal is to become the fastest 50 yard dasher in the school, a program of anaerobic fitness should be implemented. In either case, the development of exercise programs is guided by four important principles: specificity, individuality, overload and reversibility.

Specificity. As explained above, specificity of exercise is the principle that states that the results of training are specific to the type of training. Specificity of exercise is often further delineated as metabolic specificity and skill specificity.

Changes in the efficiency of the metabolic system as a result of training are specific to the training given. If anaerobic training is the focus, as in volleyball, football or discus throwing, the anaerobic metabolic system will adapt and change. If training focuses on endurance exercises, adaptations and changes will effect the aerobic metabolic system.

Skill specificity means that the closer the training activities are to the actual skill to be performed, the better the performance of the skill. This is a result of neuromuscular adaptations and learning. Initial skill learning is thought to be primarily neurological. Changes in actual strength, speed, flexibility or other motor skills occur after the initial neurological learning changes.

Individuality. Individuality is an important concept to remember in designing exercise programs. Everyone adapts to training in slightly different ways. The same program will not be of the same benefit to everyone. The level of skill, fitness and a little genetic predisposition play a role in the results of any exercise program.

Overload. Overload states that in order to achieve adaptations that result in improved exercise performance, the muscle must be stressed to produce more and more. The level of work a muscle is able to perform efficiently changes as the muscle adapts to the level of work required. Training is based on stressing the muscle or systems to a certain percentage of their maximum abilities. The maximum that a muscle is able to perform is often used as the guide for determining the level of overload needed to stress that muscle and cause strength ad-

aptations. The maximum or predicted maximum of the aerobic system is often used as a guide to determine the level of overload needed to adapt the system for endurance training. Of course, training is not based on exercising the muscle to its maximum every session. Injury can result from maximum stress on the muscle or system.

Interestingly, to continuously overload a muscle, one must be aware that the overload may need to be increased as the muscle changes and adapts. Here too, the individuality principle is important as these changes will occur at different times with different people and must be continuously reassessed.

Reversibility. Reversibility is a concept none of us want to address. Unfortunately, it takes only a fraction of the time to lose muscle and system adaptations gained through weeks, months and years of exercise. McArdle, Katch and Katch (1996) report that even among highly trained athletes, the benefits of exercise can be quickly lost.

The good news is that maintenance of the desired fitness level is significantly easier than obtaining the desired level. Once the desired level of fitness is achieved, the frequency of exercise may be reduced significantly while maintaining the same level of fitness.

Components of an Exercise System

The components of an exercise system are the frequency, intensity and duration of training. An exercise prescription is developed that outlines the type of exercise training to be conducted, and the frequency, intensity and duration of the exercise training. This prescription is individually developed from the results of exercise testing of the limits of the muscles and systems, discussion with the person about their needs and an assessment of any risk factors that may result from the implementation of the exercise program.

Frequency. The American College of Sports Medicine (ACSM) has suggested that aerobic exercise be conducted a minimum of 5 days a week (ACSM, 1995). Strength training, on the other hand, is to be conducted every other day with a complete rest day in between for muscle recovery and fuel replenishment.

Intensity. Intensity is defined as a percentage of maximum performance. Moderate intensity exercise has been shown to be the most beneficial and the least risk producing for training the aerobic system (Skin-

ner, 1993). Studies have shown that higher level intensity programs do not produce more beneficial results and that injury is more likely to result from high intensity programs. Moderate intensity for endurance training is defined as 60-85% of the maximum capacities of the cardiopulmonary system. The range is determined by the initial fitness level of the individual. The more fit, the closer to the higher end of moderate is acceptable. Elderly people and sedentary people are often prescribed 40-50% for the initial stages of exercise training.

Strength/speed programs emphasizing the anaerobic system are often based on a percentage of a one repetition maximum for the muscle to be trained. For example, if the biceps can move a maximum of 80 pounds, 60% of that maximum is then used to begin training. The training then involves progressive increases in the amount of weight moved as the system adapts to training.

Duration. The American College of Sports Medicine (ACSM, 1995) has recommended a minimum of 20-30 minutes of exercise, 5 days a week to improve endurance and cardiopulmonary fitness. The exercise program should progress through 4-6 weeks of initial, low intensity conditioning. A longer duration of 4-5 months of moderate intensity training is then followed by a lifetime of maintenance.

Strength/speed training and anaerobic exercises are completed in short increments of intense work. The exercise may involve 30-60 seconds of all out work followed by a period of a few minutes for rest and recovery of fuel stores in the muscle. There are several programs designed to improve anaerobic fitness through interval training, fartlek training or periodization. The scope of this article does not allow for complete descriptions of the several suggested training methodologies. However, in book print at this time, Promise System (Promise & Signorile, in press) will be an excellent reference for information on periodization training.

So What Does All This Have to Do with Speech and Voice?

Recent years have seen a strong resurgence interest in exercise as evidenced by the increase in exercise periodicals and exercise specialists (ACSM, 1998, personal communication). Exercise has been proven to reduce the risk of heart disease and cancer, to combat stress (Robbins, 1993) and

to reduce the signs of aging (Timiras, 1993). When you are in shape, you can breathe more easily, move more easily and endure longer durations of physical stress. It is only logical that many authors have proposed that getting in shape will improve speech and voice (Miller, 1996; Saxon & Schneider, 1996; Stark, 1975). Unfortunately, to date, there are NO articles published in peer reviewed journals that have tested the hypothesis that "in shape" people are better singers or speakers or that getting "in shape" will improve speech or voice.

What about using the principles of training skeletal muscle in the body to train the skeletal muscles in the larynx? If it was only as easy as the suggestion that the vocal mechanism muscular is skeletal muscle just like the muscles of the arms and legs. Train the vocal mechanism like you train arms and legs and you will produce better singers and better speakers. Unfortunately, it is not that simple. Motor equivalence, muscle size, accessibility of the musculature for testing, a lack of a definition of the type of exercise speech and voice training involves and the gamete of exercise used to train the speech and voice musculature make researching speech and voice training difficult. Several excellent articles explain the morphology, histology and physiology of the vocal mechanism and are excellent starting points for learning about the vocal mechanism and its intricate functioning (Cooper, Partridge & Alipour-Haghighi, 1993; Sundberg, 1987; Titze, 1994). It is important to understand the vocal mechanism thoroughly before you propose to change its functioning.

This is not to say that you cannot try to understand muscle training and implement some of the principles and components of exercise training in your daily therapy. A few simple principles guide training skeletal muscle. It has not been established that they are present in the vocal mechanism. However, they are ground rules that may help guide your therapy.

1. Muscle training is specific. Speech pathologists are always concerned with generalization of skills. But, if the vocal/speech mechanism is similar to other skeletal muscle there is little to no generalization. Going out on a limb, this author will say that you should train what you hope to achieve. If you want better /t/s...train /t/s. It has never been established that licking lips or wagging a tongue side to side makes better /t/s.

2. Speech and voice training should be individualized. This is a principle taught in Clinic I in graduate school. But, we still see cookbook programs on the market that tell us to do the same thing with every person and they will get better. The prescription for speech or voice training should be based on the speech and voice fitness level of the person, their needs and their motivation.

How do you assess a fitness level for speech and voice? Many authors have proposed ways to assess the maximum performance of the speech mechanism (Duffy, 1995) or the vocal mechanism (Hixon, 1991; Titze, 1994). It is important to know the performance limits of the muscles you are training. Work the muscles at a predetermined percentage of their maximum performance. Constantly reassess the maximum performance of the muscles and adjust the level of work on the muscle. Use of maximum performance techniques have not been validated in the literature for the speech and voice mechanism. This lack of information poses a significant stumbling block to the application of exercise principles to speech and voice training.

3. Overload the musculature to achieve a higher level of performance. This too is a tricky area that has not received enough research. If you are not able to determine the maximum performance of the muscle, how are you to determine an overload level? In addition, overloading the vocal mechanism can cause damage. Phonetograms have been suggested as a method for assessing the full potential of the vocal mechanism (Titze, 1994). Phonetograms provide a picture of the frequency and intensity range of the mechanism. However, they are time consuming and not everyone is comfortable with their use. For now, however, phonetograms provide an avenue to demonstrate the maximum ranges for both frequency and intensity of the vocal mechanism and to use as a guide for developing an exercise prescription of 65-80% of the maximum capabilities of the vocal mechanism. It is also suggested that airflow studies and inverse filtering may provide a glimpse into the maximum capabilities of the vocal mechanism. Certainly, more research needs to be done to give the Speech Pathologist a tool in establishing vocal mechanism assessments.

4. Reversibility occurs elsewhere in the body; it is not inconceivable that it occurs in the vocal and speech mechanism. Most speech pathologists note that they do not need research to validate their belief that skill is lost after therapy ends. Professional singers continue to practice daily and have vocal coaches throughout

their careers to prevent losing their skill level (McKinney, 1994; Miller, 1995). Yet, in therapy, the person is rarely counseled that without a maintenance program of continued exercise some, if not most, of their newly acquired skills will be lost.

Finally, an important note. Exercise is intended to improve the speed, strength,

endurance and flexibility of muscles. It is not intended to heal muscles that are injured. Remember, the athlete either stops exercising the injured muscle or significantly reduces the components of the exercise program for the injured muscle until it heals. Use exercise to train and retrain muscles, not to heal injured muscles.

REFERENCES

- American College of Sports Medicine (1995). *ACSM's guidelines to exercise testing and prescription*. Baltimore, MD: Williams & Wilkins.
- Cooper, D., Partridge, L., & Alipour-Haghighi, F. (1993). Muscle energetics, vocal efficiency and laryngeal biomechanics. In Titze, I. (Ed.) *Vocal fold physiology: Frontiers of basic science* (pp. 37-92). San Diego, CA: Singular Publishing Group.
- Duffy, J. (1995). *Motor speech disorders: Substrates, differential diagnosis and management*. St. Louis, MO: Mosby.
- Hixon, T. (1991). *Respiratory function in speech and song*. San Diego, CA: Singular Publishing Group.
- McArdle, W., Katch, F. & Katch, V. (1996). *Exercise physiology: Energy, nutrition and human performance*. Baltimore, MD: Williams & Wilkins.
- McKinney, J. (1994). *The diagnosis and correction of vocal faults*. Nashville, TN: Genevox Music Group.
- Miller, R. (1996). *The structure of singing: System and art in vocal technique*. New York, NY: Schirmer Books.
- Robbins, A. (1993). *Powertalk: Strategies for lifelong success*. California: Robbins Research International, Inc.
- Saxon, K. & Schneider, C. (1996). *Vocal exercise in physiology*. San Diego, CA: Singular Publishing Group, Inc.
- Skinner, J. (1993). *Exercise testing and exercise prescription for special cases*. Philadelphia, PA: Lea & Febiger.
- Stark, J. (1975). Vocal gymnastics in singers. *Journal of Canadian Association of University Schools of Music*, 5, 67-75.
- Sundberg, J. (1987). *The science of the singing voice*. DeKalb, IL: Northern Illinois University Press.
- Timiras, P. (1993). *Physiological basis of aging and geriatrics*. Boca Raton, FL: CRC Press.
- Titze, I. (1994). *Principles of voice production*. New Jersey: Prentice-Hall.
- Wojtys, E., Huston, L., Taylor, P. & Bastian, S. (1996). Neuromuscular adaptations in isokinetic, isotonic and agility training programs. *The American Journal of Sports Medicine*, 24, 187-192.

Contact Author:

Edie R. Hapner, M.S., CCC-SLP
 Evelyn Trammell Voice & Swallowing Center
 St. Joseph's Medical Center, Atlanta, GA

Different Phonetics for Different Folks: Studies of Speaker Differences at UCF

Jack Ryalls
Penelope Baldauff
Julius Fridriksson
Dianne Thornburgh
Allison Zipprer
University of Central Florida
Orlando, FL

We have been using Voice Onset time as one means of investigating speaker differences at the University of Central Florida. Voice Onset Time, or VOT, pertains to the timing difference which distinguishes voiced and voiceless stop consonants. In this short article, these investigations will be described in a simple, non-technical manner, providing an overview of this research effort. The reader is referred to the particular research articles for detail on the particular subjects, procedures and measurements in each of these studies.

While you probably remember the difference between voiced and voiceless stop consonants in terms of whether or not the vocal folds are vibrating, it turns out not to be a simple "all or none" distinction. Because all vowels are voiced, and since stop consonants cannot be produced without a vowel, then voicing is always present sooner or later in all stop consonants - sooner for voiced stop consonants and later for voiceless stop consonants.

The voicing may actually begin before the release of a stop consonant, in which case the voice onset time is negative (this is also known as "prevoicing"). Negative VOT voiced stops are typical in languages like Spanish and French. Our research shows that many native English speakers also produce voiced stops with negative voice onset times (Ryalls, Baldauff & Zipprer, 1997).

Some of the differences in VOT that we have been investigating are between male and female speakers, between early versus later learners of English and between African-American versus Caucasian-American speakers. We are documenting these differences in order to create a more accurate normative data base with which to compare the VOT productions of speakers with various speech-language pathologies (e.g., aphasia or dysarthria). Presently, much of the so-called "normative" data for acoustic characteristics of speech come from only Caucasian adult male speakers. It is currently not well understood how gender, aging and ethnic background affect the acoustic characteristics of speech.

Thus, it was found that female speakers tend to have shorter negative VOT values than did male speakers (Ryalls, Baldauff & Zipprer, 1997). This difference may relate to smaller lung volumes used by female speakers (Hoit, Solomon & Hixon, 1993).

It was also found that African-American speakers tended to have longer negative VOTs for voiced stop consonants. The

gender and ethnic background factors suggest that African-American males have the longest negative VOT values for voiced stop consonants. In a related study of formant frequencies in vowels (Fridriksson & Ryalls, 1997), it was also found that African-American males tended to have lower formant frequency values than did their Caucasian counterparts. This confirms some other results for formant frequencies from Mayo and Grant (1995) and Mayo and Manning (1994).

In another study of Voice Onset Time we investigated the potential difference between early versus late learners of English in adult Spanish-English bilinguals (Thornburgh & Ryalls, 1997). Since voiced stops in Spanish are typically produced with large negative VOT values (Lisker & Abramson, 1964), it was predicted that "early" learners of English would have more English-like VOT values than would "late" learners of English. For purposes of this study, "early" was defined as before the age of 12 years, and "late" as after 12 years. However, it was found that both groups of speakers produced a "hybrid" VOT value which was between the typical for monolingual Spanish speakers and that typical for monolingual speakers of English. Speakers were doing this many years later, even though they had begun learning English before the age of 12. We hypothesize that speakers do this because this particular contrast does not lead to a phonemic difference. It causes no misunderstandings because listeners do not hear a different word. The situation would be very different in a language such as Thai where the negative VOT values resulted in different phonemes and hence different words.

Our research emphasizes that we are just beginning to understand some of the complex ways in which different speakers produce different acoustic realizations of speech. Who we are, and what makes us all different individuals, leaves subtle but measurable traces in our speech production. In other words, it appears that even normal speech is much more variable than previously suspected. It is now important to discover the principles for this variation, and this task should also provide us with a better understanding of speech production in general.

Several studies of Voice Onset Time differences among various speaker groups are considered. It was found that gender, ethnic background and age of onset of second language instruction were all factors that affected Voice Onset Time production.

REFERENCES

- Fridriksson, J. & Ryalls, J. (1997). *Formant frequency differences in vowels produced by African-American and Caucasian male speakers*. Manuscript submitted for publication.
- Hoit, J., Solomon, P. & Hixon, T. (1993). Effect of lung volume on voice onset time (VOT). *Journal of Speech and Hearing Research*, 35, 516-521.
- Lisker, L. & Abramson, A. (1964). A cross-language study of voicing in initial stops: Acoustical measurements. *Word*, 20, 384-422.
- Mayo, R. & Grant, W. (1995). Fundamental frequency, perturbation and vocal tract resonance characteristics of African-American and White American males. *Echo: National Black Association for Speech-Language Pathology*, 17, (2), 32-38.
- Mayo, R. & Manning, W. (1994). Vocal tract characteristics of African-American and European-American adult males. *Tejas: Texas Journal of Audiology and Speech Pathology*, 20, 33-36.
- Ryalls, J., Zipprer, A. & Baldauff, P. (1997). A preliminary investigation of the effects of gender and race on voice onset time. *Journal of Speech, Language and Hearing Research*, 40, 642-645.
- Thornburgh, D. & Ryalls, J. (1997). Voice onset time in Spanish-English bilinguals: Early versus late learners of English. *Journal of Communication Disorders*, 31, 215-229.

The World Wide Web as a Source of Therapy Ideas:

20 Practical and Applied Sites for Use with Culturally and Linguistically Diverse Students

Alejandro Brice

University of Central Florida,
Orlando, FL

Celeste Roseberry-McKibbin
Hazel Oak Research Laboratories

School-based speech-language pathologists (SLPs) face challenges today as they undertake providing services to students from culturally and linguistically diverse (CLD) backgrounds (Brice & Montgomery, 1996; Cheng, 1996; Crago, Eriks-Brophy, Pesco & McAlpine, 1997; Gutierrez-Ciellen, 1996; Kayser, 1996; Kayser, 1995; Langdon & Saenz, 1996; Quinn, 1995; Roseberry-McKibbin, 1997; Westby, 1997). The first challenge is appropriately identifying students from CLD backgrounds as needing speech-language services, while the second challenge is finding appropriate materials to meet the needs of these students. Regarding the first challenge, information on assessment of bilingual students is growing (Brice & Montgomery, 1996; Cheng, 1996; Crago, Eriks-Brophy, Pesco & McAlpine, 1997; Gutierrez-Ciellen, 1996; Hamayan & Damico, 1991; Kayser, 1996; Kayser, 1995; Langdon & Saenz, 1996; Quinn, 1995; Roseberry-McKibbin, 1997; Westby, 1997). Unfortunately, information on appropriate intervention materials for bilingual students lags behind assessment information (Brice & Montgomery, 1996; Cheng, 1996; Gutierrez-Ciellen, 1996; Hamayan & Damico, 1991; Langdon & Saenz, 1996; Peña, Quinn & Iglesias, 1992; Roseberry-McKibbin, 1995). Use of existing therapy materials should be expanded for bilingual students based on their unique field dependent learning styles and language needs (Campbell, 1994; Kayser, 1995; Langdon, 1992; Roseberry-McKibbin, 1995). Field dependent persons show a greater ability to cooperate, are more socially inclined and show a greater sensitivity to interpersonal relationships (Gilbert & Gay, 1985). Hence, speech-language pathologists must supplement existing materials and methods with new methods and materials (for example, accommodating a field dependent learning style) obtained from the World Wide Web in order to better serve the needs of the bilingual students.

With the increasing availability of sources of information on the World Wide Web (WWW), it is possible for school-based SLPs to find many materials, approaches to treatment and practical sources of information that pertain to serving CLD students. The purpose of this article is to provide a brief review of 20 sites and links that clinicians will find useful as they serve CLD students.

The three criteria employed in this non-exhaustive listing have been: (a) the mate-

rials, approaches and sources must be appropriate for students from CLD backgrounds, (b) the materials, approaches and sources must be appropriate for students with speech and language disorders, and (c) the materials, approaches and sources must be applied and clinically relevant (i.e., not entirely theoretically based). Please remember that sites may appear and disappear; however, all attempts at finding secure sites have been made. The sites are not juried and not monitored, therefore, the SLP should use caution and judgment when selecting and using the sites as supplements for therapy. Speech-language pathologists should provide clinical direction at all times when using the sites interactively with the students. The name of the site (in bold) and the address are given along with a brief description of the site. When appropriate, some information is given as to how the material, approach or source may be clinically applied. The site name is in bold, whereas the site address is given in parentheses.

World Wide Web Sites

1. **The Comenius Group** (www.comenius.com) has a site for online access to relevant English language materials, services and products. They offer a Weekly Idiom list (www.comenius.com/idiom/index.html) with definitions available.

2. **A Word A Day** (www.wordsmith.org/awad/index.html) is a site which mails out different vocabulary words and definitions to its subscribers. An example word and definition was "abstemious". Abstemious means to eat and drink in moderation.

3. **Wordwatch** (www.titania.cobuild.collins.co.uk/wordwatch.html) is another site for English vocabulary building. This site gives more commonly used English words along with examples of their use. A definition for refute was given.

4. A hypertext **Webster's Dictionary** is available (www.c.gp.cs.cmu.edu:5103/prog/webster).

5. **Test Your English** (www.go-ed.com/english/practice/csc/test.html) is a site with an 80 question test of English. It covers such areas of English syntax and semantics.

6. **The Hypertext English Language Practice** (www.go-ed.com/english/practice/rside/home.html) site provides practice on prepositions "on" and "up" along with relative clauses, relative pronouns and animal

School-based speech-language pathologists (SLPs) face multiple challenges today as they provide services to students from culturally and linguistically diverse (CLD) backgrounds. A limited amount of culturally and linguistically appropriate material exists for school age children. With the advent of sources of information on the World Wide Web (WWW), it is possible for SLPs to find materials, approaches and practical sources of information for use CLD students seen for speech and language therapy. The purpose of this article is to provide a review of 20 sites and links that clinicians will find useful for CLD students.

idioms. A grammar quiz is also provided.

7. The site **Focusing on Words** (www.wordfocus.com/index.html) is devoted to enhancing vocabulary skills through looking at the Greek and Latin elements of words. An activity that focuses on sensory words presents the poem of "The Blind Men and the Elephant" by John Godfrey Saxe.

8. **Fluency Through Fables** (www.comenius.com/fable/index.html) presents short, one paragraph stories and then asks a series of questions on vocabulary found in the fable.

9. **Haiku for People** (www.home.sn.no/home/keitoy/haiku.html) is a site devoted to the 17 syllable poetry verse. Haiku consists of three metrical units of 5, 7 and 5 syllables.

10. The **ESL Quote Page** (www.pacificnet.net/~sperling/cookie.pl.cgi) presents a daily quote. No explanation of the quote is given; hence, this may be an activity for which SLPs engage their students in dialogue over the quote.

11. **Dave's ESL Idea Page** (www.pacificnet.net/~sperling/ideas.html) from David Sperling is a bulletin board where ESL teachers have posted ideas on teaching English. The ideas seem practical and applicable to SLPs.

12. The **Phrasal Page** (www.eslcafe.com/pv/pv-list.html) is a list of commonly used phrasal verbs. Some phrasal verbs under the letter "A" include "act up",

"add up to" and "ask out". No explanation is given for the meanings; therefore, the SLP can use the phrases as exchange exercises with her/his students.

13. **Social Factors** (www.logos.uoregon.edu/explore/socioling/social.html) is a page covering some pragmatics of language examples. This page is appropriate for SLPs working with adolescent students. The SLP can use the examples as exercises with her/his students.

14. **Project Bartleby Familiar Quotations** (www.cc.columbia.edu/acis/bartleby/bartlett/index.html) indexes quotes by famous authors.

15. **The American Literature Classics - Chapter A Day** (www.mindport.net/arezis) features on-line books with a different chapter posted each day. In addition, a reader's discussion room is provided.

16. **MidLink Magazine**. The Electronic Magazine for Kids in the Middle Grades (www.longwood.cs.ucf.edu:80/midlink/) contains stories written by children for children.

17. **Stone Soup** (www.stonesoup.com/main2/siteindex.html) contains stories by young writers, links and resources and children's art from around the world.

18. **Inkspot** (www.inkspot.com) is an electronic resource for writers. This site may be applicable for SLPs working with adolescent and high school age students.

19. **U.S. Department of Education Office of Educational Research and Improvement Programs for the Improvement of Practice Helping Your Child Learn Science** (www.ed.gov/pubs/parents/science/index.html) is a site devoted to assisting parents encourage science learning in children. Multiple activities are applicable to SLPs.

20. **Teachers Helping Teachers** (www.pacificnet.net/~mandel/index.html) provides applied teaching tips to new teachers as well as a forum for experienced teachers to share tips and ideas. This site is applicable for school based SLPs.

CONCLUSIONS

The main advantage of using the World Wide Web for finding sources of information is the vastness of material that is available. For minimal or no cost, school-based clinicians may access the Web and collect easily obtainable information. This information is not meant to replace educational training provided through courses or continuing education. However, this material may supplement the SLPs repertoire of techniques and materials currently used (Iskowitz, 1998; Scott, 1998). Clinicians can use information about bilingual education resources as well as information about language and learning disabilities in bilingual students to increase their own and others' knowledge about improving services to bilingual students in schools.

REFERENCES

- Brice, A. & Montgomery, J. (1996). Adolescent pragmatic skills: A comparison of Latino students in ESL and speech and language programs. *Language, Speech and Hearing Services in Schools*, 27, 68-81.
- Campbell, L. R. (1994). Clinical practicum and English proficiency. In D. Scott (Ed.) *Challenges in the expansion of cultural diversity in communication sciences and disorders - Sea Island Multicultural Institute: Compilation of papers*, 59-62. Rockville, MD: American Speech-Language-Hearing Association.
- Cheng, L. (1996). Enhancing communication: Toward optimal language learning for the limited English proficient students. *Language, Speech and Hearing Services in Schools*, 27, 347-354.
- Cheng, L. (1991). *Assessing Asian language performance*. Oceanside, CA: Academic Communication Associates.
- Crago, M., Eriks-Brophy, A., Pesco, D. & McAlpine, L. (1997). Culturally based miscommunication in the classroom. *Language, Speech and Hearing Services in Schools*, 28 (3), 245-254.
- Gilbert, S. & Gay, G. (1985). Improving the success in school of poor black children. *Phi Delta Kappan*, 67, 133-137.
- Gutierrez-Clellen, V. (1996). Language diversity: Implications for assessment. In K. Cole, P. Dale & D. Thal (Eds.) *Advances in assessment of communication and language*, 29-56. Baltimore, MD: Brookes Publishing.
- Hamayan, E. & Damico, J. (Eds.) (1991). *Limiting bias in the assessment of bilingual students*. Austin, TX: Pro-Ed.
- Kayser, H. (1996). Cultural/linguistic variation in the United States and its implications for assessment and intervention in speech-language pathology: An epilogue. *Language, Speech and Hearing Services in Schools*, 27(4), 385-386.
- Kayser, H. (Ed.) (1995). *Bilingual speech-language pathology: An Hispanic focus*. San Diego, CA: Singular.
- Langdon, H. & Suenz, T. (Eds.) (1996). *Language assessment and intervention with multicultural students*. Oceanside, CA: Academic Communication Associates.
- Peña, E., Quinn, R. & Iglesias, A. (1992). The application of dynamic methods to language assessment: A nonbiased procedure. *The Journal of Special Education*, 26 (3), 269-280.
- Quinn, R. (1995). Early intervention? Qué quiere decir eso ... What does that mean? In H. Kayser (Ed.) *Bilingual Speech-Language Pathology: An Hispanic Focus*, 75-96. San Diego, CA: Singular.
- Roseberry-McKibbin, C. (1997). Understanding Filipino families: A foundation for effective service delivery. *American Journal of Speech-Language Pathology*, 6 (3), 5-14.
- Roseberry-McKibbin, C. (1995). *Multicultural students with special language needs: Practical strategies for assessment and intervention*. Oceanside, CA: Academic Communication Associates.
- Westby, C. (1997). There's more to passing than knowing the answers. *Language, Speech and Hearing Services in Schools*, 28 (3), 274-287.

Contact Author:

Alejandro Brice, Ph.D.
Department of Communicative Disorders
University of Central Florida
12424 Research Park Blvd., Ste. 200
Orlando, FL 32826-2215

The Impact of Identifying Preferred Treatment Outcomes on Conceptualizing, Assessing and Treating Chronic Stuttering

Eugene B. and Crystal S. Cooper
Nova Southeastern University, Fort
Lauderdale, FL

The American Speech-Language-Hearing Association's continuing efforts in developing a National Outcomes Measurement System (NOMS) to assess the efficacy of speech-language pathology and audiology clinical practice is one factor leading to significant changes in how chronic stuttering is conceptualized, assessed and treated. As preferred functional outcomes of stuttering treatment become accepted by the professional community, clinicians increasingly are aware of the need to view chronic stuttering as a syndrome with affective, behavioral and cognitive components rather than as a unidimensional disorder in the fluency of speech. Clinicians focusing primarily on measuring the frequency of their client's disfluencies are finding that the frequency of stuttering alone is one of the least valid and reliable measures by which preferred functional outcomes of stuttering treatments can be assessed. The recognition that altering feelings and attitudes, as well as behaviors, is critical to achieving preferred stuttering therapy outcomes has strengthened the call for counseling procedures being included in the education of clinicians.

In 1993, the American Speech-Language-Hearing Association established the Task Force on Treatment Outcomes and Cost Effectiveness to create a national outcomes database for speech-language pathologists and audiologists. Obviously, the creation of the Task Force was in response to the burgeoning growth in management health care systems designed to control escalating health care costs. It became evident to all that if the services of our practitioners are to be covered in health insurance plans of any nature, we must be capable of describing the preferred functional outcomes of our services and of presenting evidence of the efficacy of those services. Recognizing the need to develop a national outcomes database, the ASHA Task Force initiated the development of the "National Outcomes Measurement System - NOMS." The key to the system is the use of the seven-point Functional Communication Measures (FCMs) that are scored by the clinician at the time of the client's admittance and at the time of discharge. At the same time, the Task Force invited the various disorders-related interest groups to participate in the monumental task of setting functional outcome goals for every disorder-type and in identifying and developing instruments to measure the success or failure in achieving these goals.

In response to that call, the American Speech-Language-Hearing Association's Special Interest Division for Fluency and Fluency Disorders charged its 1997 Annual Leadership Conference with reaching consensus on preferred treatment outcomes for those who stutter. The charge was extended to the 1998 Annual Leadership Conference with the additional charge of beginning to develop scaling procedures for assessing success or failure in the achievement of the preferred outcomes previously identified. The complexity of the conference charges quickly became evident to the conferees and the resulting discussions raised significant issues relative to how stuttering is conceived by the profession as well as assessed and treated.

Although conferees used the terms "fluency disorder" and "stuttering" interchangeably, there was no question that the group's focus was on stuttering rather than on fluency disorders related to such conditions as Tourette's Syndrome, dysarthria, dyspraxia, cluttering, spasmodic dysphonia and palilalia. Following two days of small group discussions, participants in the 1997 Lead-

ership Conference arrived at a consensus regarding general statements of preferred stuttering fluency outcomes from the clinicians' and the clients' perspectives. They are as follows:

The Clinician's Perspective: The preferred fluency treatment outcome is that the client will demonstrate feelings, behaviors and thinking that result in improved communicative performance and satisfaction with the therapy process.

The Client's Perspective: The preferred fluency outcome is an increased feeling of fluency control with a concomitant decrease in feelings, behaviors and attitudes that comprise the stuttering syndrome (*Fluency and Fluency Disorders Newsletter*, September 1997).

Participants at the 1998 Leadership Conference, referring to the previous year's conference report, identified statements that could be scaled in a variety of ways. After editing the previous year's preferred outcome statements to make them compatible for use with the seven-point scale model utilized in the National Outcomes Measurement system, conferees began the task of identifying appropriate descriptors for points along a continuum from one to seven for the various preferred outcome statements. Some groups focused on developing scales for adults and others focused on developing scales for children. Finally, conferees categorized each statement as to whether the statement primarily assessed affective, behavioral or cognitive components of the stuttering syndrome. The "Prototype Scales for Assessing Preferred Functional Outcomes of Stuttering Therapy," which appears at the end of this article, is an example of one format such scales might take. It will take effort and time for researchers and clinicians to develop such scales to the point that their validity and reliability are demonstrated.

Conceptualizing Stuttering

It was evident to conferees that assessing the client's frequency of fluency failures would not suffice. Reports of various groups confirmed the observation that a significant majority of the conferees hold that the client's feelings (affect) and attitudes (cognition) need to be assessed as well as other fluency-related behaviors. This conclusion was re-affirmed in the second conference. In agreeing that the assessment of preferred fluency treatment outcomes must address changes in the clients' feeling, behavior and attitudes, the conferees appeared to be ac-

cepting the view that chronic stuttering might best be described as being a syndrome. Such a notion has been around at least since the first quarter of the twentieth century (Bluemel, 1932, 1957). Cooper and Cooper (1985a, 1993, 1998) have suggested that the label "stuttering" might usefully be viewed as a diagnostic label referring to a clinical syndrome, characterized most frequently by abnormal and persistent disfluencies in speech accompanied by characteristic affective, behavioral and cognitive patterns. Such a use of the term acknowledges that not all children who are disfluent are "stutterers" because the characteristic affective, behavior and cognitive patterns that typify the clinical problem of stuttering are not present. By viewing stuttering as a syndrome, the question of etiology becomes one of identifying a variety of causative factors rather than that of identifying a single factor. Chronic stuttering can be viewed productively, as so many of us are, as resulting from the **interactions** of multiple co-existing physiological, psychological and environmental factors. Such an etiological statement appears to some as being simplistic and of little clinical value. To others, the focus on the **interactions** of variables known to be related to chronic stuttering is resulting in an increased understanding of how the **interactions** of such things as the child's genetic predispositions, environment and psychic state can result in a stuttering syndrome. The move to identify and measure preferred functional outcomes for the treatment of stuttering may well result in changes in how clinicians conceptualize the clinical problem known as stuttering.

Assessing Stuttering Syndromes

The focus on functional treatment outcomes is altering how chronic stuttering is assessed. As the move to develop measures of preferred stuttering treatment outcome variables attest, clinicians increasingly will be adding instruments for assessing functional outcomes to their existing assessment protocols. For the past thirty years, many stuttering assessment protocols focused primarily on the measurement of disfluencies,

with the assessment of the clients' feelings and attitudes being viewed as being of secondary significance. The need to provide data to "prove" to efficacy of our treatment procedures is leading to the re-examination of stuttering therapy goals from the perspectives of the clients, their loved ones and those who provide third party support for treatment services. The clients' feelings and attitudes can no longer be ignored. As difficult as it is to measure such variables, we must do so. Fortunately, there have been many attempts to assess changes in the feelings and attitudes of clients in stuttering therapy (Cooper, 1966; Cooper and Cooper, 1985b; Lanyon, 1967; Manning, 1996; Watson, 1987; Williams, 1978; Woolf, 1967). Such efforts, in conjunction with the Division of Fluency and Fluency Disorders' continuing efforts at stimulating the development of scales for assessing preferred functional outcomes, will undoubtedly result in the development of an array of easily administered and scored instruments to assess preferred treatment outcomes.

Treating Stuttering

The move to identify and measure preferred functional stuttering outcomes undoubtedly will have a significant effect on stuttering treatment programs. Focusing on affective and cognitive changes as well as on behavioral changes will result in a new generation of stuttering clinicians concerned more with the counseling aspects of their client-clinician relationships than with the client's frequency of stuttering. Clinicians increasingly are being required to demonstrate the efficacy of their therapeutic intervention by providing clinical data. Such data will need to indicate how successful the clinician is in enabling the client to attain the preferred treatment outcomes sought by clients, their families, third-party payers and society. Unquestionably, adding the assessment of preferred functional treatment outcomes relating to feelings and attitudes to the stuttering clinician's role will result in an increased awareness of the significance of the clients' feelings and attitudes to therapeutic success. Dealing with client feelings

and attitudes requires a helping relationship best described as being a counseling rather than an instructional type relationship. Such client-clinician relationships in stuttering therapy were described in detail prior to behaviorism's ascension to dominance in the 1960's (Cooper, 1966). Recently, as evidenced by the numbers of books appearing on counseling, there is a rebirth of interest in educating clinicians to be a good counselor as well as a good instructor (Cooper, 1997). Unquestionably, attending to the client's perceptions of preferred treatment outcomes will further that interest.

SUMMARY

The drive to identify and to measure preferred functional treatment outcomes to ultimately determine the efficacy of speech-language therapy programs is having an impact in how stuttering is conceived, assessed and treated. Indications are that counseling-type therapeutic relationships will once again become the dominant form of helping relationships for those experiencing a stuttering syndrome. In the meantime, the American Speech-Language-Hearing Association's Division for Fluency and Fluency Disorders will be continuing its efforts in facilitating the development of instruments enabling us to determine the efficacy of stuttering treatment.

Eugene B. Cooper has served six years on the Steering Committee of the American Speech-Language-Hearing Association's Special Interest Division for Fluency and Fluency Disorders, the last five as Division Coordinator. Crystal S. Cooper has served as ASHA Vice President for Professional Practice in Speech-Language Pathology, president of the Public School Caucus and currently serves on ASHA's Clinical Certification Board. Both Coopers are Fellows of the American Speech-Language-Hearing Association. Their "Personalized Fluency Control Therapy" was the first comprehensive assessment and treatment program kit for stuttering to made commercially available.

REFERENCES

- American Speech-Language-Hearing Association (1998). *National outcomes measurement system*. Rockville, MD: Author.
- American Speech-Language-Hearing Association (1998). *Preferred fluency therapy*. Division for Fluency and Fluency Disorders Newsletter, September, 1.
- Blumel, C.S. (1932). Primary and secondary stuttering. *Quarterly Journal of Speech*, 18, 187-200.
- Blumel, C.S. (1957). *The riddle of stuttering*. Danville, IL: Interstate Publishing Co.
- Cooper, E.B. (1966). Client-clinician relationships and concomitant factors in stuttering therapy. *Journal of Speech and Hearing Research*, 9, 194-207.
- Cooper, E.B. (1993). Chronic preservative stuttering syndrome: A harmful or helpful construct? *American Journal of Speech-Language Pathology*, September, 11-15.
- Cooper, E.B. (1997). Fluency disorders. In T.A. Crowe (Ed.) *Applications of counseling in speech-language pathology and audiology*. Baltimore, MD: Williams and Wilkins.
- Cooper, E.B. & Cooper, C.S. (1985a). Clinician attitudes toward stuttering: A decade of change (1973-1983). *Journal of Fluency Disorders*, 10, 19-23.
- Cooper, E.B. & Cooper, C.S. (1985b). *Personalized fluency control therapy - Revised*. Austin, TX: ProEd.
- Cooper, E.B. & Cooper, C.S. (1996). Clinician attitudes toward stuttering: Two decades of change. *Journal of Fluency Disorders*, 21, 119-135.
- Cooper, E.B. & Cooper, C.S. (1998). Multicultural considerations in the assessment and treatment of stuttering. In D.E. Battle (Ed.) *Communication disorders in multicultural populations*, 247-274. Boston, MA: Butterworth-Heinemann.
- Lanyon, R.I. (1967). Stuttering severity scale (SS). *Journal of Speech and Hearing Research*, 10, 836-843.
- Manny, W.H. (1966). *Clinical decision making in the diagnosis and treatment of fluency disorders*. Albany, NY: Delmar Publishers.
- Watson, J.B. (1987). Profiles of stutterers' affective, cognitive and behavioral communication attitudes. *Journal of Fluency Disorders*, 12, 389-405.
- Williams, D. (1978). Stutterers' self-ratings of reactions to speech situations. In F. Darley & D. Spreisterback (Eds.) *Diagnostic methods in speech pathology* (2nd ed.). New York, NY: Harper & Row.
- Woolf, G. (1967). The assessment of stuttering as struggle, avoidance and expectancy. *British Journal of Disorders of Communication*, 2, 158-171.

Contact Author:

Eugene B. Cooper, Ed.D.
1107 Fairfield Meadows Drive
Weston, FL 33327
e-mail ebcooper@msn.com

Preferred Treatment Outcomes
PROTOTYPE SCALES FOR ASSESSING

PREFERRED FUNCTIONAL OUTCOMES OF STUTTERING TREATMENT

CLIENT ADULT VERSION

Directions: Clients complete the instrument at the beginning of treatment, at the conclusion of therapy and at other times during and after therapy as deemed necessary to obtain indications of changes in the disorders' affective, behavioral and cognitive components.

Read each statement and circle the word(s) on the scale that follows, what best describes your response to the statement:

Affective Components

1. I enjoy communicating

1	2	3	4	5	6	7
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

2. I feel comfortable as a speaker.

1	2	3	4	5	6	7
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

3. I like the way I sound.

1	2	3	4	5	6	7
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

4. I feel I can modify my speech in even the toughest situations.

1	2	3	4	5	6	7
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

5. I am satisfied with my overall speech fluency.

1	2	3	4	5	6	7
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

Behavioral Components

1. I avoid speaking situations.

1	2	3	4	5	6	7
				<i>More than</i>	<i>Almost</i>	
<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Half the time</i>	<i>Half the time</i>	<i>Always</i>	<i>Always</i>

2. I avoid words.

1	2	3	4	5	6	7
				<i>More than</i>	<i>Almost</i>	

Preferred Treatment Outcomes						
<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Half the time</i>	<i>Half the time</i>	<i>Always</i>	
	<i>Always</i>					
3. My speech is becoming more fluent.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>
4. I use fluency-enhancing techniques or strategies.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
				<i>More than</i>	<i>Almost</i>	
<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Half the time</i>	<i>Half the time</i>	<i>Always</i>	<i>Always</i>
5. When I stutter I do things such as blink my eyes, look away and shake my head.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
				<i>More than</i>	<i>Almost</i>	
<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Half the time</i>	<i>Half the time</i>	<i>Always</i>	<i>Always</i>

Cognitive Components

1. I need speech therapy.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>
2. My speech negatively affects my vocational success.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>
3. My speech negatively affects my social success.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>
4. I understand my stuttering problem.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>
5. I am doubtful if therapy can help me.						
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>Strongly</i>	<i>Mildly</i>				<i>Mildly</i>	<i>Strongly</i>
<i>Disagree</i>	<i>Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Agree</i>	<i>Agree</i>

NOTE: The above noted statements to which clients are asked to respond were randomly selected and edited from the listing of client preferred outcomes for stuttering therapy identified at the American Speech-Language-Hearing Association Division for Fluency and Fluency Disorders' Fifth Annual Leadership Conference, Marco Island, FL, April 29-May 2, 1998. The scale is presented simply as an example of how such preferred functional treatment outcomes scales might be created and is not presented as a clinically validated assessment scale.

The Falconer "Lipreading" Test for Nonorganic Hearing Loss

Teri A. Hamill

University of New Mexico

Albuquerque, NM

Susan Karasick-Rush and

Mark N. Segal

University of New Mexico Health

Sciences Center,

Albuquerque, NM

In the recently published article on pseudohypacusis testing in clinical practice, Lupton (1995) reported upon the relative frequency of use, and perceived effectiveness, of tests for nonorganic loss as reported in a survey completed by 53 audiologists. The Falconer "Lipreading" Test received a 13 of 21 ranking for effectiveness, and had been used by only 9 of the 53 audiologists. The Falconer test is presented auditorily at below-admitted-threshold levels with concomitant visual presentation. The patient is asked to "lipread" the monosyllabic stimuli which are essentially not lipreadable. Above-chance performance indicates hearing of the auditory stimuli. The purposes of this report are to acquaint readers with the Falconer test and its administration; to present additional data on scores attained using the Falconer as a screening test for nonorganic loss; to encourage more widespread use of the Falconer; and to present an illustrative case demonstrating its utility.

Description of the Original Falconer "Lipreading" Test

The Falconer "Lipreading" Test (Falconer, 1966) makes use of the frequently reported claim by those with nonorganic loss that lipreading is valuable in overcoming the effects of their "hearing loss." The Falconer can be used even with those who do not make this overt claim if the audiologist suggests to the patient that he/she is surprised at how well the patient functions, considering their hearing loss, and suggests lipreading ability may explain the discrepancy.

Prior to the development of the Falconer, tests of speechreading had been administered, with auditory stimulation presented at sub-admitted-threshold levels (Cohen, Cohen, Levine, Maisel, Ruhm & Wolfe, 1963; Hallewell, Goetzinger, Allen & Proud, 1966). Scores which were greater than those obtained when no auditory stimulation was present indicated a nonorganic component to the loss. The Falconer "Lipreading" Test is an ingenious test for predicting actual hearing thresholds which, like its predecessors, presents sub-admitted-threshold auditory stimuli along with the material ostensibly to be lipread. It controls for the variability in natural lipreading ability by utilizing stimuli which are essentially not lipreadable. Each of the eight 20-word lists contain stimuli with homophenous words present in the other lists. For example, the homophenous words "mud", "but", "bun" and "bud" occur in four different lists. The stimuli are presented visually

with accompanying auditory presentation at a level below admitted threshold. According to Falconer, without auditory stimulation scores of 3/20 correct or fewer are typical. Scores above this level suggest that the stimuli were heard. Figure 1 summarizes Falconer's results obtained on a group of normal hearers, and two groups of patients with sensorineural loss. The connected lines in figure 1 represent the outer limits of the 2 standard deviation range of the most extreme of the studies. Limited sample size precluded Falconer from reporting standard deviations at intensities below -4 dB SL re: spondee threshold (ST).

Falconer (1966) recommended beginning the test at an above-admitted-threshold level, and decreasing stimulus intensity in 6 dB steps. He proposed that when performance falls to 5/20 correct identification, the stimulus level is at or near threshold, or alternatively, threshold is 5 dB below the 10/20 correct performance level.

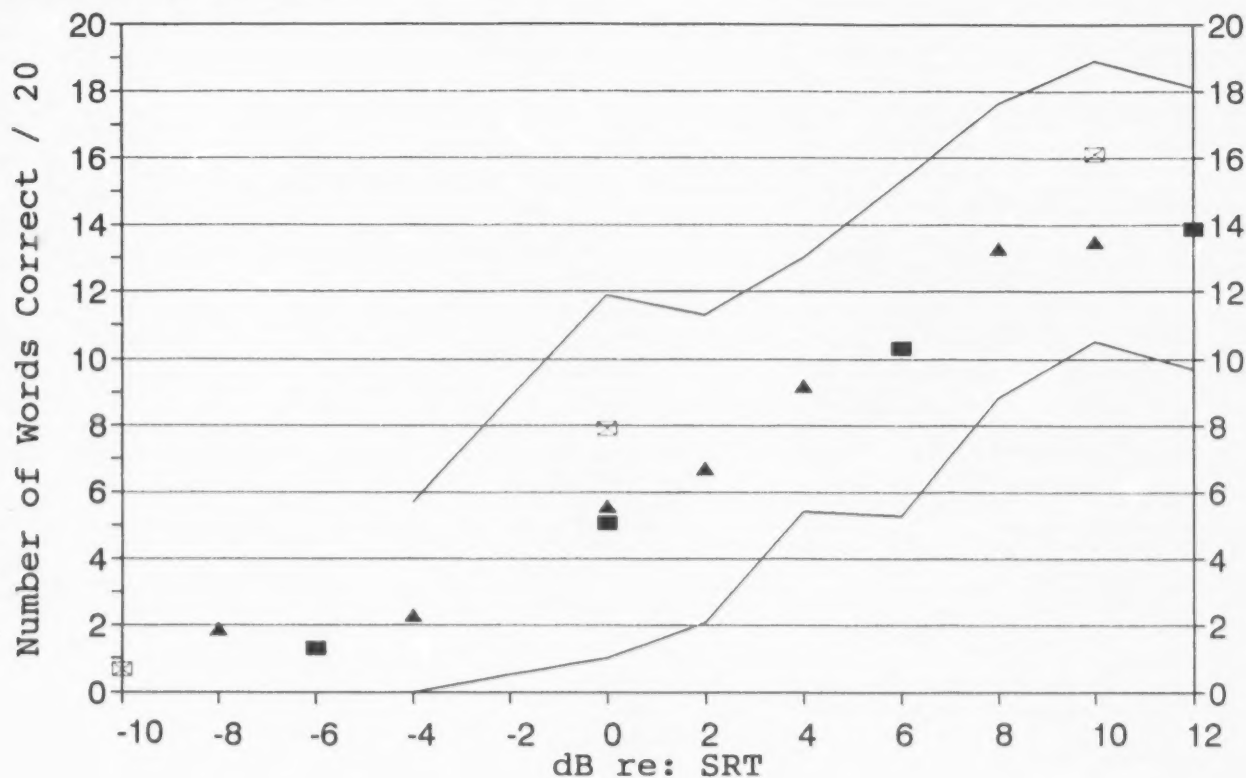
Data on Expected Score with Subthreshold Stimulus Presentation

In order to obtain more information on the range of scores which can occur without auditory stimulation, the first author requested that her student clinicians and clinical fellows in audiology complete a screening version of the Falconer whenever time permitted, or whenever nonorganic loss was suspected. 71 normal hearers (ST < 25 dB HL) and 33 hearing impaired were tested. The presentation level was -10 dB SL re: ST in the poorer ear. If a score of 6/20 or greater was obtained, decreasing the level and retesting was required.

In 14 of the 104 cases, the Falconer score was 6 or greater out of 20. In 7 of these cases the score can be explained. In four cases, nonorganic loss was documented. In one case, the test was administered to a patient with a unilateral loss without contralateral masking, permitting the cross-over to stimulate the nontest ear. One normal hearing patient volunteered that the clinician could be heard through the booth window. One patient with grossly normal hearing had an ST elevated from the PTA, and readministration at -10dB SL re: PTA revealed a score of 2/20. The six remaining cases are unexplained. Following readministration at -10dB lower levels the scores of 3 of the 6 fell below 6 correct. In the other 3 cases the presentation level was already at -5 or -10dB HL, and retesting was not conducted. In one case the clinician

The Falconer "Lipreading" Test for Nonorganic Loss is administered by simultaneously presenting monosyllabic words visually and auditorially at a below-admitted-threshold level. The patient is instructed to "lipread" the words, which are homophenous. Above-chance performance indicates that the stimuli were heard. Administration procedures are reviewed and data are presented detailing the performance level expected without auditory stimulation. A case report which illustrates the use of the Falconer is presented.

Figure 1. Graphic representation of the data from Falconer (1966). Mean word recognition scores obtained for three groups of subjects shown with symbols. Connected lines represent the outer limits of the 2 standard range of the most extreme of the studies.



☐ Normal Hearers ▲ 1st SNHL Group ■ 2nd SNHL Group

failed to retest at a lower intensity.

The results, including data from the initial test of the 7 subjects described above whose elevated Falconer scores were inexplicable, reveal the following. Normal hearers scores ranged from 0-9/20 with a mean of 3.2 correct, and a standard deviation of 1.8 words. The hearing impaired scored on average 2.75/20 correct, ranging from 0-8/20 correct, with a 2.2 word standard deviation. The hearing impaired standard deviation is very similar to that reported by Falconer, while the normal hearers' standard deviation is somewhat higher. The present data indicate that the two standard deviation range for subthreshold presentation extend to 6.8 words correct for normal hearers, and 7.1 for hearing impaired. This suggests cautious interpretation of scores 7 or less, as they can occasionally occur in the absence of stimulation but, according to Falconer's data, can also occur with stimulus levels as high as 7 dB SL.

Previous Report of Falconer Efficacy

Weiss (1971) demonstrated that the Falconer test accurately predicts threshold. The organic subjects (6 with normal hearing, 21 with sensorineural loss) had group mean pure tone average (PTA), spondee threshold and Falconer-predicted spondee threshold were within 2 dB. The nonorganic loss group (n=54 ears) had mean initial PTA of 68 dB HL, initial spondee threshold of 49 dB HL and Falconer-predicted spondee threshold of 29 dB HL which compared favorably to the 29 dB HL final spondee threshold. The mean difference between the predicted and final STs was approximately 6 dB for both the organic and nonorganic subjects. These results illustrate the fact that ST/PTA discrepancies (and other test inconsistencies) will frequently alert the audiologist to the presence of an "exaggeration" of threshold but do not predict threshold, whereas the Falconer can be used to esti-

mate threshold with reasonable accuracy. Unlike the Stenger, it can also be applied to the prediction of threshold when bilateral impairment is simulated.

Case Report on the Usefulness of the Falconer

The usefulness of the Falconer is illustrated by the following case. C.R., a 47 year old female, was seen at the University of New Mexico Hospital (UNMH) for chronic middle ear effusion. She was additionally requesting an increase in state disability status above her current 20% rating. Previous audiometric testing conducted in another state revealed bilateral flat hearing loss, which fluctuated in severity from moderate to profound. Air bone gaps of 15-30 dB were consistently found; immittance test results were not reported. Medical records indicate that there was a history of otitis media, and that the onset of the loss was at age 4. The patient had been fit with hearing

aids, which she reported could not be worn due to allergy to the hypoallergenic earmolds.

When seen at UNMH, it was noted that the patient followed conversation with ease, and had no characteristics of deaf speech. Hearing testing conducted July, 1994 revealed flat losses in each ear, with a 95 dB HL PTA in the right ear, and a 85 dB PTA in the left ear. Flat tympanograms and absent reflexes were found; medical evaluation documented the presence of bilateral otitis media. Due to the discrepancy between her hearing abilities and the audiometric data, auditory brainstem response testing was conducted which revealed responses at 60 dB nHL bilaterally. In September of 1994 ventilation tubes were inserted bilaterally, and the finding of glue ear was confirmed at surgery. Audiometric testing immediately after surgery continued to indicate a profound bilateral loss, with both ears having pure tone averages of 90 dB HL. Audiometric testing in November, 1994 revealed no improvement in behavioral thresholds, in spite of the patency of the tubes. A 90 dB HL PTA was found in the right ear, and 100 dB HL PTA in the left ear. As had been true in each previous audiometric evaluation, the ST and PTA were within 10 dB. Ascending threshold testing revealed approximately 10 dB of threshold improvement. Inconsistent responses to instruction were observed with below-threshold level stimulation.

When the patient was told a "lipreading" test would be administered, she protested to having no unusual skill in that regard. The clinician countered that given her excellent communication ability, she very likely had acquired the ability without noticing, which is typically the case. The lighting was adjusted to best illuminate the speaker's face, and the test was then administered in the right ear. Initial presentation was at 75 dB HL. After 9/10 words were correctly repeated, the presentation level was lowered to 60 dB HL, which produced a score of 15/20. At 40 dB HL the score was 9/10. Testing was concluded after a score of 9/10 was obtained at 25 dB HL. This score predicts a threshold for speech of approximately 20 dB HL.

At this point, the speech microphone was set to 55 dB HL, and the clinician called in a colleague for "advice". Although both clinicians understood the meaning of the results, one clinician asked the other to evaluate the error patterns. The second clinician

concurred that the types of sounds recognition patterns were highly unusual, and could not happen with any significant hearing loss present. She volunteered that perhaps the first clinician had misinstructed the patient during pure tone testing. While still having the speech microphone active, the clinician agreed that she may have rushed through the instructions. She then increased the hearing level to approximately 90 dB HL and proceeded to explain to the patient that she probably had not been clear on the instructions; the task was to respond when the sounds were quiet, rather than waiting until they were loud as the patient was doing. Although the patient indicated that she had been confused, the "graceful out" was not entirely successful, as thresholds improved by only 25-40 dB HL. However, the results of the Falconer were sufficient to indicate at least grossly normal hearing in one ear. The patient was advised that hearing was returning, and that while test inconsistencies were present, that they were likely due to having had normal hearing only so recently. She was told that her "listening ability" would continue to improve, and she would likely have normal hearing very soon. As of yet, the patient has not returned for reassessment.

Suggested Modifications to the Falconer to Permit Efficient Testing

Obviously, if the patient realizes the purpose of the Falconer, it can be easily defeated; however, the obscurity of the tests makes it unlikely that even a patient who has researched audiology texts would be familiar with this test. Discovery of Falconer's true purpose during testing can be forestalled by departing from Falconer's original test procedures which required many lists to be administered with gradually decreasing stimulus levels. The procedure used in this clinic is to present the first word list at 20-25 dB below admitted threshold, which can be used as a screening test, and which prevents having to contrive a reason for presenting the stimuli with combined auditory and visual stimulation. Rather than indicating that auditory stimuli may be present, the clinician instructs the subject (with either monaural or binaural presentation) that the test is of lipreading ability. The audiologist then "carelessly" neglects to fully attenuate the speech microphone.

When performance is well above chance-level, (e.g. 8/10 correct), only half-lists need be used. Discreteness in chang-

ing stimulus intensity is important if the true nature of the test is not to be revealed. Between lists (or half-lists) the audiologist generally turns the speech signal up to an "audible" level to reassure the patient that all is well, and then the test is continued, with the attenuator set at a still-lower intensity. A decrement of 10 - 20 dB is used at the discretion of the audiologists. Typically, as the patient's performance begins to decrease, it is suggested that the patient did so well, a slightly more difficult list will be used next. This ruse permits continued testing if the level selected was so low that chance-level lipreading performance was attained, in which case the audiologist can indicate that indeed most people are not able to lipread those words, and can then suggest that the next list (presented with a higher stimulus intensity) will be easier. When combined with a fast-paced presentation which does not permit the patient time to contemplate upon the nature of the test, this typically prevents the patient from realizing the true nature of the task. When numerous changes in intensity are necessary, a departure from the routine of "instructing" then resetting the level may be in order. The "negligent" audiologist will "accidentally" move the attenuator while overtly turning to cough or to respond to person not in the patient's view.

While it would seem that after approaching threshold, the patient would recognize the test purpose, this is often not true, although it is generally prudent to switch ears before threshold is reached. In the case presented above, monaural testing was sufficient to document the nonorganic nature of the loss and the adequacy of hearing for speech. Therefore the decision was made not to test the left ear. If desired, bilateral testing can be conducted. This is easily done by binaurally presenting speech at the "audible" level following completion of testing in one ear. The clinician complements the patient on their excellent abilities and suggests that the performance is so exemplary that the clinician would be very interested in seeing how well the patient does on a "slightly different test." The least obvious means of changing ears is to initially instruct binaurally, then to "forget" one last remark and turn on only one microphone for the last minute instruction or query (e.g. whether a different viewing angle would be better). The single channel can then be "carelessly" attenuated. Without benefit of acting lessons, binaural threshold results have been obtained on several adult and adolescent clients.

This test has been administered to children and younger teens, but without success. Until some maturity has been attained, the patient will not realize why lipreading ability should be claimed, and thus will not simulate this ability.

The authors encourage clinicians to experiment with this test. Appendix I provides a form which can be used to record the results. Figure 1 is also helpful clinically. As Falconer originally suggested, when correct identification decreases to 5/20, threshold is approximated. Figure 1 also can assist in determining probably threshold from initial test results which aids in deciding on the next intensity increment. For example, if the patient scored 14/20 correct, figure 1 reveals that this performance level is typical when the stimulus level is 8-12 dB suprathreshold, but could occur with stimulus levels at 5 dB SL (low-

est intensity within the 2 standard deviation ranges which yields 14 words correct). If it is believed that you are approximately 10 dB suprathreshold, it may be beneficial to use a 10 dB intensity decrement with the next list; but, given the probability of poorer performance, "warning" the patient that the next list might be more difficult would be appropriate.

While the degree to which the stimuli are likely suprathreshold can be estimated from this figure as well, it should be cautioned that the nonorganic patient often will miss a few items purposefully, apparently in an attempt to avoid looking "too good". This behavior can be reduced by giving the "raised eyebrow look" after the first miss, as if to say "I can't believe you missed that one", followed by a repetition of the stimulus.

SUMMARY

In summary, the Falconer provides reasonable estimates of spondee thresholds. The average score at threshold is approximately 5/20 as reported by Falconer. This study demonstrates that with below-actual-threshold presentation, scores are typically 2-3/20 correct, but can be expected to be occasionally higher, though typically not above 6 correct. The Falconer is simple to administer, does not require special equipment and can be used in cases of bilateral nonorganic loss either to estimate hearing in one or both ears.

ACKNOWLEDGMENT

The majority of the subthreshold Falconer data was collected by Ronni Glass and Tori Gustafson while in the employ of Texas Tech University. Their support of this project was indispensable.

REFERENCES

- Cohen, M., Cohen, S.M., Levine, M., Maisel, R., Ruhm, H. & Wolfe, R.M. (1963). Interdisciplinary pilot study of nonorganic hearing loss. *Annals of Otolaryngology and Laryngology*, 72, 67-82.
- Falconer, G.A. (1966). A "lipreading test" for nonorganic deafness. *Journal of Speech and Hearing Disorders*, 31, 241-247.
- Hallewell, J.D., Goetzinger, C.P., Allen, M.L. & Proud, G.O. (1966). The use of hypnosis in audiologic assessment. *Acta Otolaryngologica*, 61, 205-208.
- Lupton, L. (1995). "Nope, I didn't hear that one either": Pseudohypacusis in clinical practice. *Audiology Today*, 7 (1), 16-17.
- Weiss, B.G. (1971). Predicting organic hearing levels: The Falconer lipreading test for nonorganic deafness. *Journal of Auditory Research*, 11, 223-226.

Contact Author:

Teri A. Hamill, Ph.D.
Department of Communicative Disorders
University of New Mexico
901 Vassar, NE
Albuquerque, NM 87131
e-mail hamillt@bootes.unm.edu

APPENDIX I

STIMULI FOR THE FALCONER "LIPREADING" TEST FOR NONORGANICE LOSS

Record ear and presentation level above list. Actual word repeated may be recorded in space to the right if desired.

List 1A	List 2A	List 3A	List 4A
Level _____	Level _____	Level _____	Level _____
Ear _____	Ear _____	Ear _____	Ear _____
# Correct _____	# Correct _____	# Correct _____	# Correct _____
mud _____	nap _____	patch _____	bun _____
camp _____	but _____	juice _____	stunt _____
tap _____	crowd _____	mind _____	moan _____
crutch _____	stunned _____	dub _____	lap _____
lamb _____	sag _____	bone _____	bland _____
pays _____	match _____	cab _____	when _____
birch _____	bite _____	stun _____	shoes _____
shoots _____	plan _____	wet _____	known _____
mite _____	tone _____	crown _____	pet _____
boat _____	crunch _____	nab _____	sank _____
badge _____	wink _____	bud _____	perch _____
dumb _____	chews _____	bays _____	wing _____
stud _____	purge _____	merge _____	cap _____
ground _____	base _____	met _____	tub _____
wick _____	lamp _____	sang _____	crowned _____
sack _____	gap _____	wig _____	maze _____
bed _____	bet _____	crush _____	batch _____
note _____	numb _____	toad _____	dab _____
plant _____	moat _____	plaid _____	bind _____
wed _____	went _____	lab _____	grudge _____

List 1B

Level _____

Ear _____

Correct _____

led _____

itch _____

come _____

dame _____

rank _____

creed _____

strayed _____

not _____

pint _____

dim _____

wad _____

crab _____

bend _____

monk _____

face _____

send _____

black _____

pan _____

beat _____

mob _____

List 2B

Level _____

Ear _____

Correct _____

pine _____

dip _____

fade _____

blank _____

nod _____

hinge _____

name _____

strained _____

bunk _____

mat _____

mop _____

let _____

wan _____

greed _____

bean _____

sent _____

cram _____

pent _____

rack _____

gum _____

List 3B

Level _____

Ear _____

Correct _____

said _____

mine _____

bob _____

tip _____

pat _____

hitch _____

lend _____

dot _____

rag _____

plank _____

wand _____

fate _____

bead _____

meant _____

mug _____

cup _____

grab _____

straight _____

green _____

tame _____

Falconer Test

List 4B

Level _____

Ear _____

Correct _____

bent _____

cup _____

greet _____

what _____

cramp _____

itch _____

bide _____

strain _____

set _____

tape _____

vein _____

plaque _____

lens _____

bug _____

nip _____

pop _____

rang _____

don _____

meat _____

pad _____

Information for Authors

The *Florida Journal of Communication Disorders* publishes clinical and research articles, case studies, review articles, tutorials, clinical reports/methods/programs and papers addressing professional issues under the auspices of the Florida Association of Speech-Language Pathologists and Audiologists.

Manuscript contents considered for publication include medical speech-language pathology and audiology; instrumental procedures in the management of speech, language, hearing or swallowing; treatment strategies/efficacy; educational audiology; speech-language pathology and audiology in the schools; hearing aid fitting; aural rehabilitation electrophysiological methods; multicultural and diversity issues; aides, assistants and associates in the clinical setting; managed care strategy; total quality improvement; health care reform; preferred practice parameters; and others. Only previously unpublished manuscripts will be considered.

Manuscripts are peer reviewed by at least two members of the Editorial Review Committee, Associate Editors and/or Editor. At least one is required to have a relevant expertise in the content area. Manuscripts are evaluated with respect to the following variables: merit of the idea, topic or content area; adequacy of the literature review, introduction and/or purpose of the work; strength of the methodology, argument and/or presentation of information; adequacy of the data analysis, interpretation and/or conclusion drawn based on information presented; overall organization and writing style; and professional relevance to the membership.

Manuscripts should be typed, double-spaced and single-sided. Submit three copies. Your name and other identifying information should be omitted from two of the three copies for blind review. Manuscripts for the 1998 *Journal* should be addressed to:

Shelley J. Victor, Ed.D., Editor
Florida Journal of Communication Disorders
213 123rd Way
Coral Springs, FL 33071

Manuscripts will be accepted, accepted with revisions, or rejected. Manuscripts accepted with revisions will be returned to the first author who will have the option of making the recommended revisions, or providing evidence to the contrary. Once the manuscript has been typeset, only minimal revisions are permissible.

Contributions are expected to follow the style specified in the Publication Manual of the American Psychological Association (4th Edition). Manuscript style requirements regarding tables and figures, acknowledgments, references and research subjects are consistent with those specified in the Information for Authors section of the *Journal of Speech and Hearing Research*. Page charges and reprints do not pertain.